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Strategy 2010

Perspectives for Research, Technology and Innovation in Austria

Further Development of the National Research and Innovation Plan

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Preamble

The Austrian Council for Research and Technology Development is marking the end of its first term in office by presenting a new position paper "Strategy 2010 – Perspectives for Research, Technology and Innovation in Austria." This builds upon the National Research and Innovation Plan (NAFIP) published in December 2002 and contains guidelines for Austrian research, technology and innovation policy with a time horizon of 2010 and beyond.

There are many reasons for this publication. On the one hand, the general framework has changed considerably in recent years. R&D investments in Austria have developed positively and are now significantly higher than the European Union average and well on the way to achieving the goal of a research quota of three percent of gross domestic product by 2010. This was made possible not least of all by the additional public expenditure that was used to finance the two Action programmes and payouts by the National Foundation for Research, Technology and Development. Industry has also substantially stepped up its innovation activities.

The Universities Act 2002 (UG 2002) has created the basis for a fundamental modernisation of the academic system. The establishment of the Austria Wirtschaftsservice Gesellschaft (AWS) and the Austrian Research Promotion Agency (FFG), the reform of the Fund for the Promotion of Scientific Research (FWF) and the creation of the National Foundation for Research, Technology and Development represented important steps toward the structural reform of the funding landscape.

On the other hand, studies and analyses have provided considerable new input for the development of strategic concepts, as exemplified by the Government Research and Technology Reports of recent years, the individual studies and evaluations that were commissioned and the report "Platform Innovation" to name just a few.

This strategy paper addresses decision-makers in politics, administration and at the funding institutions as well as all experts from science and industry and anyone interested among the general public. The Austrian Council hopes that it will stimulate broad discussion within the government and in parliament, and sees this document as the basis for a strategy for Austria to be formulated by decision-makers that should also include an implementation plan.

The Austrian Council hopes that this strategy paper will help to encourage a more intense debate about research, technology and innovation in Austria and ensure that this policy area is given greater priority. Only with a clear focus (also in budgetary terms) on research, technology and development will we be able to safeguard the international competitiveness of our science and industry, high-calibre jobs and the intellectual, social and cultural development of our country in the long term. Sustainable economic growth and growth in employment can only be achieved and protected in the long term by a consistent and strategically guided RTI policy.

In doing so, the Austrian Council is fulfilling its self-assigned function as a strategic advisory body to the Austrian Government on all RTI policy issues. As such, it draws up recommendations in close dialogue with the key players in RTI policy for the medium and long-term strategic orientation of this policy area and makes statements concerning investment decisions where public funds are used.

The Austrian Council would like to thank all its dialogue partners who support its work and who were involved in the formulation of this strategy.

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Executive Summary

With this "Strategy 2010 – Perspectives for Research, Technology and Innovation in Austria," the Austrian Council for Research and Technology Development is opening a new phase of the public debate on RTI policy. The objective is to intensify a strategic discourse that should culminate in the development of a national action plan.

The Strategy 2010 is geared to the global objective of:

- **Strengthening the competitiveness and dynamism of the Austrian economy in order to provide for sustainable economic growth and an expansive increase in the levels of employment.**

Review and Outlook

The starting point for Strategy 2010 is an assessment of the progress Austria has made in terms of its RTI policy at the end of the first term of office of the Austrian Council for Research and Technology Development (established in 2000), and three years after the Austrian Council published the National Research and Innovation Plan. Overall, it shows a gratifying picture. In recent years Austria has managed to catch up in terms of RTI policy. Over the last five years, the research quota in Austria has risen from 1.9 to 2.35 percent and is now significantly above the EU average.

Important structural reforms such as the establishment of the Austria Wirtschaftsservice Gesellschaft (AWS), the Austrian Research Promotion Agency (FFG), and the reform of the Fund for the Promotion of Scientific Research (FWF) promise greater efficiency in the innovation system.

Today these results show that Austria has the prospect of catching up with the top European performers in research, technology and innovation. Realising this chance requires both a firm commitment from all the players in the innovation system to further increase the support they have so impressively demonstrated in the catching-up process, and maintaining investment in research and development (R&D) at the steep rate of growth seen in previous years. At the same time, it is necessary to substantially improve the quality and efficiency of the Austrian innovation system, thus increasing the return on investments in R&D.

The new strategic orientation can be summarised in three basic principles:

- **Promote quality on a broad level and excellence at the top.**
- **Strengthen networking and co-operation between science and industry.**
- **Improve the efficiency and effectiveness of the promotion system.**

Goals and Fields of Action

In keeping with this strategic orientation the Austrian Council has identified ten strategic fields of action and formulated specific recommendations for each:

>> At the **universities** it is essential to create and guarantee for the future conditions that enable research and teaching to meet the highest standards of international excellence. The Austrian Council therefore recommends:

- increasing funding for the university research infrastructure programme
- increasing the FWF budget by some nine percent per year
- promotion of special and distinct profiles at universities that will lead to a concentration of degree programmes

>> Strengthening the innovative ability of **business enterprises** is crucial for actively shaping the structural change that is taking place in the wake of globalisation and is consequently a central objective of RTI policy. The Austrian Council therefore recommends:

- optimising the system of indirect research promotion
- increasing the FFG budget by some nine percent per year
- optimising the instruments for strengthening start-up dynamics and expanding the Headquarters Strategy

>> Collaboration between players from science and industry in the **co-operative sector** is essential to ensure the efficiency of the innovation system and must be

stepped up. The Austrian Council therefore recommends:

- the consistent continuation of the growth strategy for the co-operative sector
- the rapid implementation and provision of appropriate funding for the programme for the further development of the competence centres
- merging the BRIDGE programmes at the interface of basic and applied research started by the FWF and FFG and increasing the funding for these programmes.

>> The development of a **strategy of excellence** accompanied by a campaign to improve quality at all levels of the innovation system should guarantee Austria's advance to a position as an international front-runner. The Austrian Council therefore recommends:

- implementing the concept for a university of excellence under the title "Austrian Institute of Advanced Science and Technology" (AIST)
- developing a concept for a strategy of excellence encompassing all sectors of performance
- measures to facilitate the emergence of further centres of excellence in all sectors of performance

>> The development of the European Research Area requires that national RTI policy have an **international orientation** and the development of clear participation strategies. The Austrian Council therefore recommends:

- the development of a national strategy for participation in the programme lines ERA-NET, ERA-NET plus and Art. 169 programmes within the scope of the 7th Research Framework Programme
- increased participation in existing research structures in Europe

>> The **regional dimension** plays an important role in the innovation system, making the efficient co-ordination of regional and national R&D activities a priority.
The Austrian Council therefore recommends:

- establishing a co-operation platform to harmonise federal and provincial activities
- increasingly positioning the Fachhochschulen as regional crystallisation points for research networks
- bundling federal technology transfer programmes

>> Safeguarding **human resources** for R&D requires an increase in the percentage of women in research, first-class university education as well as measures to foster mobility. The Austrian Council therefore recommends:

- the implementation of gender mainstreaming (GM) in all areas of RTI policy and the continuation of the fForte initiative to promote women in research and technology
- the development of an Austrian strategy to promote lifelong learning
- the reorganisation of grant programmes

>> The **state** must act strategically in its diverse roles as a promoter, customer, regulator and administrative manager in order to increase the dynamism of innovation processes. The Austrian Council therefore recommends:

- the nationwide expansion of e-government services
- the reinforcement of research themes with double dividends such as the FORNE strategy for sustainability research or the programme on security research

>> Following institutional reforms the promotion system now requires efficient management of the **funding portfolio** at the programme level with monitoring and evaluation instruments. The Austrian Council therefore recommends:

- concentrating the RTI competences of the federal government at two ministries
- outsourcing programmes to the funding agencies that in the past have been handled by the ministries
- drawing up an integrated overall concept for the portfolio of RTI funding programmes
- obligatory evaluation for all programmes with a life of more than five years or a volume of at least one million euros

>> After the gratifying development in recent years, **spending** on R&D must be steadily increased still further and focused upon strategic objectives. The Austrian Council therefore recommends:

- an increase in public funding for R&D by seven to nine percent annually
- the largest increase in R&D expenditure in the co-operative sector (an increase of some 80 percent by 2010), a 70 percent increase for the business sector and an approximately 40 percent increase for the university sector
- a clear structural logic commensurate with the use of the individual sources of financing (financing of basic programmes and open-ended expenditure from the ordinary budgets, National Foundation for RTD funding for new programmes and initiatives with a long term focus, Action Programme funding for impulse programmes of a temporary nature)

Vision and Goals

Strategy 2010 is committed to the global objective of reinforcing the competitive ability and momentum for growth of the Austrian economy by boosting both the quality and quantity of research and development. The motto is: Bring More Innovation to the Market.

The catching-up process of recent years has raised Austria's research quota to a level that is above the EU average. In a new phase, it is now essential to reinforce this momentum through a strategy that adheres to the stated quantitative growth targets, but which at the same time is committed to increased and consistent efforts to improve quality and efficiency.
To this end, the Austrian Council has set itself the task of developing strategic orientations in dialogue with the ministries responsible for the agendas of RTI policy.

The emphasis will fall on the following themes:

EXCELLENCE: Promoting Quality and Outstanding Achievement

In recent years excellence has emerged as one of the most important criteria for selecting projects for funding. In many cases, scientific advances require outstanding achievements that stand out from the average. The international state of the art is the benchmark for evaluating such achievements: Outstanding achievement means being among the best in the world. Equally, a focus on excellence is also a practical category for evaluating research projects, qualification levels and research institutes. In the view of the Austrian Council, efforts to encourage a striving for excellence should be stepped up in all areas. This applies, for example, to the competitive funding of basic research projects, the promotion of special and distinct profiles at universities, the planned creation of a university of excellence, the "Austrian Institute of Advanced Science and Technology (AIST)," and the further development of competence centres. However, it should be remembered that excellence can only be achieved where there is a broad basis with a high standard of quality and wide diversity of approaches.

- **The goal is to give new impetus to quality throughout the entire innovation system by using monitoring and evaluation instruments to a greater extent, and to position Austrian research among the international front-runners in an increasing number of research themes, research projects and research teams.**

INTERNATIONALISATION: Thinking in a Global Framework

The European Research Area and the Research Framework Programmes as its key development instruments have for a long time formed central points of reference for strategic planning at the national level. Increasing international mobility, integration in international networks and the development of neighbourhood strategies are key tasks for an internationally oriented RTI policy. There are still manifold opportunities for research co-operation waiting to be seized, particularly in relation to the Central and East European EU states.

- **The goal is to position Austria as a strong and active partner in the European Research Area and over the next few years in particular to develop the country into a key network node in the European, and especially the Central and East European, Research Area.**

INTENSITY: Increasing the Use of Resources

In recent years Austria has completed a massive catching-up process in terms of R&D expenditure. From today's perspective, the goal of achieving a research quota of three percent of GDP by 2010 is certainly a realistic one. It also remains an immovable target date for RTI policy. Therefore, there must be a steady increase in

both R&D expenditure and the number of persons employed in R&D of between seven and nine percent per annum. Of course, direct financial intervention is only one of several instruments of a forward-looking RTI policy. Fiscal measures and the creation of a climate for science and industry that is conducive to innovation are equally relevant.

- **The goal is for Austria to be among those EU countries that in 2010 reach the targets laid down in the Barcelona and Lisbon processes at the national level. In particular, this includes achieving the three percent research quota, with two thirds of this expenditure financed by the private sector.**

CO-ORDINATION: Bundling the Forces of RTI Policy

In a federally structured polity like Austria, RTI policy takes place on several levels. Yet even the federal level is characterised by complex competence structures and organisational fragmentation. Furthermore, since the 1990s, the provinces have increasingly entered the ring with their own programmes and institutions. In this period they have not only expanded the volume of funding for research and technological development, but also developed their own strategies and built up their own promotion infrastructures. Particularly with regard to Austria's positioning in the European Research Area it is vital to ensure that forces are not wasted through duplication and sub-optimal scales

- **The goal is to establish rigorous instruments for strategy co-ordination and co-operation and to arrive at a clear functional structuring of responsibilities. This includes concentrating political responsibility at two ministries in keeping with international practice.**

EFFICIENCY: Goal-oriented Use of Funds

The creation of the AWS and FFG has provided the Austrian funding landscape with clear institutional structures. For the first time this will also permit a transparent division of responsibilities for strategic and operational tasks with clearly defined interfaces. It is now essential to make greater use of this division of work. The next step toward optimising funding structures for research and innovation must now set in at the programme level.

- **The goal is to enhance the development of Austria's funding system by means of an efficient portfolio management that uses methods of monitoring and evaluation in order to make targeted and co-ordinated use of the funding instruments.**

EQUAL OPPORTUNITIES: Integrate the Gender Perspective

Since the early 1990s women have accounted for more than half the students at Austrian universities and since 1999 for the majority of graduates. However, slightly fewer than one third of university assistants and less than ten percent of professors are female. Women have thus been able to take their place as students, but not,

to the same extent, as researchers in science and industry. They are still underrepresented, especially in positions of management and as decision-makers as well as in most of the natural sciences and technological disciplines (the "leaky pipeline" phenomenon). This is not only a waste of qualified human resources, it is also an obstacle to the development of RTI in Europe. If Austria wishes to achieve its ambition of being an international front-runner in RTI, it can no longer afford to do without the creativity and expertise of women.

- **The goal is to realise equal opportunities for both sexes in RTI and thus to achieve the aliquot representation of women in all sectors and at all levels of RTI. Over the next few years, the percentage of women should be significantly increased in all areas where they are currently underrepresented. The essential instruments for this are gender mainstreaming and greater efforts to promote women.**

MULTIPLICATION OF KNOWLEDGE: Strengthen Human Resources

The availability of an adequate supply of human resources with a high-quality education is the basis for thriving knowledge-based societies and a key factor for the feasibility of RTI strategies. Enabling its citizens to enjoy the best possible education is therefore one of the most important tasks of the state. However, university education must also be understood as part of a concept of life-long learning which links all areas of education and vocational further education to form a coherent and permeable overall system. Increasing the percentage of women in research and encouraging the mobility of people as knowledge carriers are also important aspects of a strategy designed to strengthen human resources.

- **The goal is to raise the quality of education and further education across all stages of the system and to close the gap to the international front-runners in order to improve the transfer and further development of knowledge and new technologies within the framework of innovation and research processes. To this end, the permeability of the education and further education system must be significantly improved.**

LOCATIONAL QUALITY: Enhance Attractiveness

The high percentage of R&D financed from abroad (at 20 percent Austria has one of the highest figures in the OECD) is proof that Austria is an attractive location for research. It is essential that this status is maintained and enhanced in coming years. Important factors in this context include the availability of human resources, integration in business clusters, the availability of infrastructure and the incentive structures of funding and fiscal policies. The potential of leading enterprises should be exploited in the regions by means of an active transfer of technology.

- **The goal is to anchor international and national companies with their central research units in Austria and to integrate them in the Austrian innovation system.**

Review and Outlook

RTI policy in Austria between 2000 and 2005 was characterised by a catching-up process involving a greater deployment of resources, new programme initiatives and the definition of new key areas. This must now be followed by a second phase in which increased expenditure remains a goal but interactions in the National Innovation System (NIS) are stepped up and optimised.

Strategic Parameters

The strategic requirements laid down by the Austrian Council and the provision of the necessary resources by the Austrian government have made it possible to implement a large number of measures to improve Austria's R&D position.

In the past five years the Austrian Council has given particular support to programmes and initiatives that were expected to have a powerful lever effect. Co-operative research therefore received higher than average funding in order to make up for the structural weaknesses in the innovation system. Programmes such as the scheme to establish competence centres have helped improve co-operation between industry and science, thus increasing the percentage of medium to long-term research projects in specific key areas. The universities have received support from the Infrastructure Programme and the so-called "Vorziehprofessuren," (a mechanism designed to retain high-calibre personnel under which a suitable candidate can be appointed to a chair before the position actually becomes vacant) The Austrian Council has defined specific RTI priorities in the fields of information and communications technologies (ICT), nano-sciences and nano-technologies, life sciences and the humanities, social and cultural sciences.

In addition to recommendations on the use of public funds, the Austrian Council has also drawn up recommendations concerning the medium and long-term strategic focus of RTI policy, with special reference to:

- Universities: organisation, infrastructure, career and mobility
- Large research institutes
- Life sciences
- FORNE – inter-ministerial sustainability strategy
- Nano-sciences and nano-technologies
- Strengthening the humanities, social and cultural sciences
- Start-up and growth financing
- The European Research Area and European research programmes
- International research co-operations
- Promoting women in research and technology
- Gender mainstreaming
- Human resources: mobility and grants
- Intellectual property rights
- Monitoring and evaluation
- Dialogue between the research sector and the public

Structural Reforms

In the years 2000 to 2005 the range of direct funding and indirect promotion measures for actors in the national innovation system were significantly improved. At the same time, organisational changes were implemented to simplify the structures.

The organisational changes manifested themselves in the establishment of the AWS and the FFG. Together with the FWF, which focuses on basic research, these organisations now provide improved and more efficient access to research funding and a complete portfolio for both science and business. Due to the expansion of the programmes for oriented basic research and co-operation between science and industry it was possible to close the funding gap previously identified.

The national promotion system essentially now consists of bottom-up funding and specific programmes that set both thematic and structural priorities:

- The wide area of bottom-up funding by the FWF and FFG forms an exclusively quality-oriented, non-theme-specific basis for free basic research and industrial research irrespective of existing Austrian and European Priority programmes.
- In the area of thematic programmes with multi-year financing, support is given to national and European key areas. The main emphasis is on the creation of critical masses, preparation for European programmes and social policy objectives.
- In the area of infrastructure programmes, support is concentrated upon co-operation between science and industry with a medium to long-term focus (Competence Centres, CD Laboratories). Attention is also given to specific measures to promote the transfer of technology and innovation to small and medium sized enterprises (SMEs).

At the political and strategic level it has not been possible to achieve a concentration (at the ministries) to date. In Austria three ministries (BMBWK, BMVIT, BMWA) and the BMF are responsible for steering research activities at the political and strategic level—in addition to other ministries with research activities such as the BMLFUW, BMLV, BMSG, BMGF.

The establishment of the National Foundation for Research, Technology and Development represents the creation of a further element at the political and strategic level designed mainly to finance long-term and thus strategic research activities.

In coming years the Austrian Council will continue to direct its attention toward co-operation between funding agencies (with the involvement of the provinces), task-sharing with the ministries and the perception of the roles of the players in the funding process.

Use of Funds

The last five years have seen a dynamic increase in spending on research and development. In 2005 EUR 5.77 billion will be invested in R&D in Austria, 43 percent more than in 2000. In line with this trend, the "research quota," another key indicator for R&D, also showed gratifying development. It rose from 1.91 percent in 2000 to 2.35 percent in 2005, clearly outstripping the EU average.

All sectors have contributed to this growth: According to a global estimate compiled by Statistik Austria, the corporate sector increased its R&D spending by 47 percent to EUR 2.48 billion in this period. The increase in R&D financed from abroad, most of which is attributa-

R&D Expenditure According to Performance Sectors

	1998		2002			2004*		
	EUR million	percentage %	EUR million	percentage %	% change from 1998	EUR million	percentage %	% change from 1998
University sector	976	28.7	1,213	25.9	+24.3	1,291	24.1	+32.3
of which Fachhochschulen & other	k. A.		21.1			26.0		
Co-operative sector of which	454	13.4	602	12.9	+32.6	720	13.5	+58.6
federal establishments and institutes, other local authorities and others (e.g. Chambers etc.)**	302	8.9	302	5.5	0	315	5.9	+4.3
R&D organisations and centres *** forming part of the co-operative sector incl. ÖAW, Boltzmann, Competence Centres etc.	152	4.5	300	6,4	+97.4	405	7.6	+166.4
Corporate Sector (corporate R&D sector) incl. non-profit sectorr	1,970	57.9	2.869	61.2	+45.6	3,335	62.4	+69.3
Gross domestic expenditure on R&D	**3,400**	**100.0**	**4,684**	**100.0**	**+37.8**	**5,346**	**100.0**	**+57.2**
R&D quota	**1.77**		**2.12**			**2.27**		

* AMC estimates and projections

** defined by Statistik Austria as „public" and sections of the corporate sector „co-operative segment" (non-profit)

*** defined by Statistik Austria as the „co-operative segment" in the corporate sector

Source: Statistik Austria, Durchführungserhebung 1998/2002, AMC-Schätzungen

ble to the corporate sector, is almost equally strong at 43 percent. Hence the percentage of companies involved in the overall financing of R&D in Austria rose from 59.6 percent in 2000 to 62.3 percent in 2004.

The provinces also reported a substantial increase of 32 percent.

In 2005 the federal government spent EUR 1.74 billion on R&D, 42 percent more than in 2000. This is also reflected in the government's Action Programmes used to channel some EUR 1.3 billion (in addition to the ordinary budget) into R&D between 2000 and 2006 inclusive.

- Action Programme I comprised a volume of EUR 508.7 million in the period 2001–2003.
- Action Programme II mobilised another EUR 600 million in the period 2004–2006.
- Since 2004 the National Foundation for Research, Technology and Development has distributed EUR 125 million p.a.
- Moreover, in the same period indirect research funding through tax incentives was substantially increased by raising the research tax allowance to 25 percent, respectively 35 percent and introducing an 8 percent research bonus.

In addition, in 2005 the federal government initiated the issue of a further bond-financed technology billion, with payouts scheduled to run until 2010. A first instalment amounting to EUR 50 million will be paid out in 2005, followed by a further EUR 75 million in 2006.

Analysis of the dynamics according to the research performance sectors for the period 1998 to 2004 shows the following picture:
The university sector (including Fachhochschulen) reported growth of 32 percent to EUR 1,291 million.
In the same period, research activities in the corporate sector grew by approximately 69.3 percent to EUR 3,335 million.

In the co-operative sector, research investments rose by 59 percent to EUR 720 million. At the same time, funding for the segment comprising the classic state-institutional sector—i.e. institutes and establishments that are in part attached to ministries, such as the Federal Office of Metrology and Surveying (BEV), the Federal Institute of Agricultural Economics, the Umweltbundesamt, the Geological Survey of Austria etc. has in fact remained at the same level.
In contrast, institutions such as the Austrian Academy of Sciences (ÖAW), Austrian Research Centers ARC, Joanneum Research and especially the competence centres developed in co-operation with industry, the Christian Doppler Research Association (CDG) and Austrian Co-operative Research (ACR) have seen investment grow by a total of approximately 166 percent (see table).

General Framework and Points of Reference

Innovation is a complex process that concerns society as a whole. Shaping this process is therefore a challenge both for RTI policy, which creates conditions that are conducive to innovation and research, and for numerous other policy areas such as fiscal, economic, social and legal policy. Competitive enterprises require a climate that fosters innovation, with contributions being made by the tax system, a flexible employment system, an absence of red tape, the structure of the capital market and a cosmopolitan culture.

Moreover, in order to overcome the challenge of structural change towards a technology-intensive highly innovative economy, RTI policy must, in agreement with other policy areas relevant to Austria's role as a business location, create incentives for innovation and suitable funding instruments. To ensure that the necessary funds are used in a sparing, appropriate and efficient manner it must be based upon the principles of performance, competition, responsibility and transparency.

At the same time, RTI policy must define itself within a changed institutional environment and must set clear terms of reference. Deregulation and liberalisation confer upon it a responsibility to create efficient market conditions, while the development of the European Research Area requires a strategic perspective that incorporates European dimensions.

Incentives for Innovation in keeping with the Market

Research and technology development take place in an economic system that is driven by market processes. These market processes thus also constitute the framework for an RTI policy that aims to optimise the results of R&D in marketable innovations. To this end it intervenes by providing funding and publicly financed infrastructure where the market by itself would lead to suboptimal solutions. However, in recent years RTI policy has gained importance as a regulator and thus as the guarantor of fair and efficient market conditions. RTI policy has diverse competences to shape an appropriate framework for innovation that is in keeping with the market. A number are listed below as examples.

– Use of the Tax System to Promote R&D

By granting tax breaks for investments in research and development, RTI policy offers incentives for corporate innovation activities. This indirect funding relies on stimulating R&D on a broad basis in an effort to reach enterprises that would otherwise find it hard to obtain programme funding and public R&D contracts. This instrument is already very well developed in Austria and also represents an important factor in the competition between locations to attract business enterprises. Nevertheless, the Austrian Council still sees room for improvement here (see explanations and recommendations in the chapter on the field of action Business Enterprises).

– Intellectual Property

Effective legal protection for intellectual property is a requisite condition for private persons to profit from their research activities. This is an essential criterion for business enterprises to invest in R&D. An efficient patent system can encourage the commercial use of inventions and ensure the optimum exploitation of new technologies. As awareness in Austria regarding the protection and marketing of research results is still underdeveloped, there is still great potential to be exploited here (see the recommendations on page 36)

– Standards and Norms

The setting of flexible standards and norms geared to the demands of the market (for example, the efficient use of energy and environmental compatibility) is a key factor for the creation of conditions conducive to innovation. Policymakers must demonstrate particular sensitivity here, as any changes to norms and standards mean a change in their market position for the players in the market.

The European Dimension

At the European level, implementation of the Lisbon process is faltering. Efforts are therefore being made to provide new impetus by shifting the focus to growth and employment in Europe.
In March 2005 the European Council concluded that the mobilisation of all suitable national and community resources should be stepped up in the three dimensions covered by the strategy (economy, society, environment) and that synergies must be improved.

At the European level, the European Commission proposes doubling annual spending on research in the Seventh Research Framework Programme, refocusing the Structural Funds as of 2007 and creating a new programme for competitiveness and innovation.
The pivotal challenge is to incorporate the Lisbon strategy in the political strategies of the member states and regions. To do this, Austria needs to achieve greater permeability between regional, national and European RTI measures in the coming years.

In the course of the new Lisbon cycle, Austria will present its National Reform Programme for 2006-2008 in autumn 2005. In the light of Strategy 2010, the Austrian Council will actively participate in drawing up the section of the reform programme dealing with research policy. The recommendations contained in Strategy 2010 should therefore form key fundamentals for the research policy and innovation-oriented measures in the Austrian contribution.
Within the scope of the reform of the Structural Funds, much greater priority will be given to "research and innovation" in the goal category "Regional Competitiveness and Employment." More money from the Structural Fund and the Cohesion Fund should be used to achieve the Lisbon goals. This requires the Austria-wide co-ordination of strategic considerations by the federal government and the provinces at the earliest possible date, and incorporation in appropriate national RTI strategies.

On the road to an open and dynamic European Higher Education Area and a Europe of Knowledge, efforts to foster mobility and remove barriers to mobility are an important aspect of European co-operation in the field of education. The Bologna process, which aims to achieve a (voluntary) convergence of university systems in Europe and increase the attractiveness of the European Higher Education Area, is a central element. The Bologna process includes, for example, the introduction of comparable degrees, two-cycle degree courses (Bachelor's and Master's), a credit system for accreditation, the transfer and accumulation of course credits, quality assurance measures and measures to foster life-long learning ("European Qualification Framework").

From an Austrian perspective, the Bologna process has significantly contributed to advancing the Europeanisation and internationalisation of the tertiary education sector. Austrian universities, Fachhochschulen and academies are in competition with other European providers. Overall, the players in the national innovation system must attune themselves to the international environment.
Through the enlargement of the European Union — and Austria's geographic position — European integration has opened up new opportunities for Austria. To position Austria as an important Central European network node for the transfer of knowledge remains a key concern of research and technology policy.

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Strategy 2010: Ten Fields of Action

Based on the experiences of the past five years and analyses of the efficiency of the innovation system, the Austrian Council has identified ten fields of action for its Strategy 2010 that should set the relevant course to be followed in the medium term:

At the **universities** it is essential to create and guarantee for the future conditions that allow research	and teaching to meet the highest standards of international excellence.
Strengthening the innovative ability of **business enterprises** is crucial for actively shaping the structural chan-	ge that is taking place in the wake of globalisation and is consequently a central objective of RTI policy.
Collaboration between players from science and industry in the **co-operative sector** is essential to	ensure the efficiency of the innovation system and must be stepped up.
The development of a **strategy of excellence** accompanied by a campaign to improve quality at all levels	of the innovation system should ensure Austria's advance to become an international front-runner.
The development of the European Research Area calls for the **international orientation** of	national RTI policy and the development of clear participation strategies.
The **regional dimension** plays an important role in the innovation system, making the effi-	cient co-ordination of regional and national R&D activities a priority.
Safeguarding **human resources** for R&D requires an increase in the percentage of women employed in	research, first-class university education as well as measures to foster mobility.
The **state** must act strategically in its diverse roles as a promoter, customer, regulator and admini-	strative manager in order to increase the dynamism of innovation processes.
Following institutional reforms, the promotion system now requires efficient management of the **fun-**	**ding portfolio** at the programme level with monitoring and evaluation instruments.
After the gratifying development in recent years, **spending** on R&D	must be steadily increased further and focused on strategic objectives.

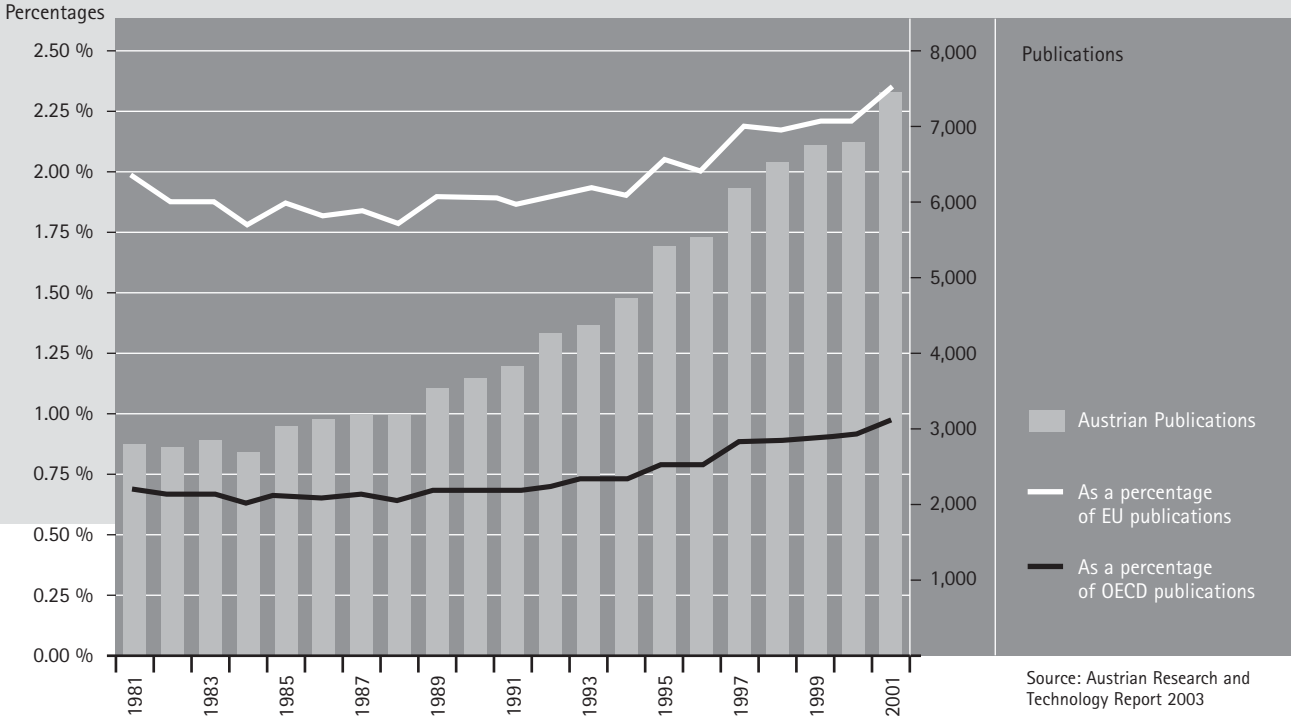
Universities

International comparisons show that since the late 1980s, scientific research in Austria has been engaged in a catching-up process. Between 1981 and 2001 the number of scientific publications from Austria approximately tripled, with these contributions being quoted an average of 4.5 times; a figure that roughly corresponds to the comparative value for the EU-15 (see fig.). While Austria has not yet managed to attain a leading position in terms of the number of publications, productivity – measured in terms of per capita publications between 1996 and 1999 – is a good deal higher than average. Only scientists from New Zealand, Switzerland and the Netherlands surpass Austria in this respect.

During the past five years the following tendencies have emerged:

- Reform of the Universities: The Universities Act 2002 has given the universities a greater degree of autonomy and considerably improved internal decision-making structures. The additional costs incurred as a consequence of autonomy have not all been recouped, leaving the universities financially weakened. In return, however, compensatory funding has been provided that is used, for example, to finance infrastructure, and support profile development and co-operation with non-university institutions and industry.
- Internationalisation of Research and Teaching: The universities are gaining autonomy and competing more strongly with one another than in the past, not merely with regard to their academic reputation, but to an increasing extent for students and research funds. This rivalry is, for the time being, taking place within national borders, but as the European Higher Education Area emerges, the universities will have to prove themselves in a larger international environment.
- Growth of the Private University Sector: Privately financed research and teaching has developed into an important element of the higher education sector in Austria.

Number and Percentages of Austrian Publications, 1981-2001



Source: Austrian Research and Technology Report 2003

- Expansion of Non-University Research: Following the establishment of autonomous, non-university research institutions in the field of basic research (competence centres, Academy institutes), some research has migrated away from universities.

- Expansion of Teaching and Research at the Fachhochschulen: A large number of (in some cases) small research institutes have been established. It is emerging that some of these institutions are too small to be effective.

Universities Act 2002

In order to provide active support for the positioning of the Austrian science sector in its international environment, a large number of reforms have been initiated in recent years (particularly with implementation of the Universities Act 2002) and effective action has been taken to make up for past omissions. The Austrian Council regards the basic focus of the Universities Act 2002 as positive and the related structural change as irreversible.

Reforms in the science sector must continue to guarantee a high level of autonomy for scientific research and an adequate financial basis for basic research. Creative research with a long-term focus requires a scope for development that must be provided by the public purse, notwithstanding uncertainty about the practical application of future discoveries. In the first instance, it is and remains the duty of the state to provide financing for research with a long-term focus.

Universities dominate scientific research in Austria; increasingly they are also carrying out application-oriented research. They follow the principle of the unity of teaching and research and traditionally perform two essential tasks: the training of young scientists and the performance of basic research that has a long-term focus and which serves to develop new scientific methods and knowledge.
It is one of the most important tasks of the state to enable all citizens who are willing and able to study to enjoy the best possible education, irrespective of the individual's financial means. The prerequisite for this is that work at the universities can be carried out at the cutting edge of international science.
In this context, particular importance is accorded to the further development of post-graduate and doctoral studies.

Fachhochschulen as Development Partners

Fachhochschulen in particular offer SMEs access to research and development. In the technology transfer chain they constitute an important element of the reciprocal exchange of technological and other scientific knowledge between universities and industry, and even between several individual business enterprises. On the whole, Fachhochschulen are competent development partners for industry and should in future therefore be increasingly positioned in larger research networks with universities.

Increasing Importance of the FWF

With the programmes of the Fund for the Promotion of Scientific Research (FWF) Austria essentially possesses the necessary funding instruments for firmly anchoring the diversity of scientific themes. Between 1999 and 2004 the funding volume of the FWF rose 34 percent from EUR 79.7 million to EUR 106.6 million. Nevertheless, the approval rates and percentage of funds awarded to submitted research projects are falling sharply. This indicates that the FWF has become increasingly important as a source of financing for universities in the

wake of implementation of the Universities Act 2002. In the view of the Austrian Council, the FWF must be provided with adequate financial resources to ensure funding for those projects that meet the international quality standards.

The Humanities, Social and Cultural Sciences as a Strength Area

Research that primarily benefits social and cultural development (and thus economic development to a lesser extent) should continue to form a clearly recognisable element of the Austrian research landscape in future. The concept presented by the Austrian Council in 2003 for the further promotion of the humanities, social and cultural sciences, (which in Austria constitute a strength area) in the university and non-university sectors, must remain the basis for future action in these areas. The core element of the quality offensive is the targeted promotion of young scholars. Furthermore, multi-year, overlapping priority programmes should also be established.

THE AUSTRIAN COUNCIL RECOMMENDS

Universities:

- increasing funding for the university research infrastructure programme.
- the promotion of special and distinct profiles at the universities on the basis of the Universities Act 2002 should lead to a concentration of departments and degree courses.
- post-graduate education should be organised through the funding of programmes modelled on international best-practice examples.
- research should also increasingly be carried out by Fachhochschulen, subject to joint execution of the project and the shared use of infrastructure with the universities. A new programme "R&D Project Funding for Fachhochschulen," should be provided for this purpose.

FWF:

- the FWF budget in the autonomous area should be increased by the amount necessary to enable it to fund overhead costs. From this basis, the funding allocation should rise by approximately nine percent each year as is necessary to meet the target of a three percent research quota in 2010.
- special emphasis should be given to allocating funds for the Special Research Areas (SFB) and the National Research Networks (NFN).

Humanities, Social and Cultural Sciences:

- The quality offensive in the humanities, social and cultural sciences must be maintained in accordance with the Austrian Council recommendation of September 2003.

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Business Enterprises

In a modern free-market economy the perspectives for social and economic development are closely linked to the competitiveness of the corporate sector. The quantitative and qualitative level of employment, and consequently the level of prosperity that societies can achieve, depend upon the performance shown by business enterprises in globalised markets.

The competitive strength of the corporate sector thus becomes a key dimension for political strategies. An integrated RTI policy plays a key role in this process given that its aim is to strengthen the innovative capacity of business enterprises. RTI policy supports activities that are designed to lead to process innovations and the development of an innovative portfolio of products and services at business enterprises.

The reorientation of domestic RTI policy initiated toward the end of the 1990s and formulated in the National Research and Innovation Plan (NAFIP) is strongly committed to the goal of safeguarding the competitive position of Austrian-based companies in the long term by strengthening application-oriented research and development. The 54 percent increase in corporate R&D spending between 1998 and 2003 and the R&D quota of 2.27 percent in 2004 demonstrate the validity of the strategy recommended by the Austrian Council.

Strengthening Innovative Capacity

It is a logical consequence of the structure of the Austrian corporate sector, which is characterised by small and medium-sized enterprises and a wide diversity of industries, that a concentration of RTI policy measures on a small number of high-tech industries would be unlikely to produce a sustainable increase in the knowledge level of domestic production as a whole (see table). A broad-based production structure demands measures with a broad impact. These include the General Programmes of the FFG as the continuation of the bottom-up funding provided by the FFF introduced in the late 1960s, and indirect funding in the form of tax concessions granted for R&D activities that have been extended in recent years.
In the view of the Austrian Council an increased volume of application-oriented R&D will especially boost the export strength of products with a high level of value-added. The emphasis should be on special support for SMEs.

The evaluation of the FFF has confirmed the benefit of non-theme specific bottom-up funding. Each year some 900 applicants have received funding from FFF programmes, with new clients accounting for some 40 percent each time. The programmes have also proved suitable for SMEs, which together after all account for some 80 percent of the assisted projects and approximately 50 percent of the financial funding volume. An impact analysis has shown that each euro of public funding generates additional private investment in R&D of approximately 40 cents.

Another study has demonstrated the high level of corporate acceptance for the special funds and the lever effect they generate. In the case of the special funds (Action Programme I - 2001-2003) an output additionality of EUR 1.71 million was achieved on the cash flow across all programmes. These analyses are sufficient proof that the funding should be continued in the future.

The Austrian Council for Research and Technology Development is therefore seeking expansion of the FFG's General Programmes. In addition, however, there should be a redefinition of bottom-up funding which places the general programmes within an integrated overall concept in agreement with thematic priority and structural programmes. Within this concept, the general programmes should assume an important function as a trend scout for new developments on the basis of the infor-

mation gained from the applications. They should also be used as a supplementary funding instrument to the priority programmes, and as continued financing modules after the expiry of specific priority programmes.

In the past, bottom-up funding was focused on supporting incremental innovations to an excessive extent. The general programmes should therefore give greater priority to supporting high-risk projects to accelerate radical innovations that make technological leaps.

Innovation in Emerging Thematic Areas

Opening up new growth potential for the domestic corporate sector is a core area of the RTI policy pursued by the Austrian Council hitherto. In particular, this includes the systematic bundling of individual funding measures to form impulse programmes that concentrate on selected thematic areas. The emerging thematic areas were selected according to criteria such as their expected contribution to growth and structural change, existing strength areas in Austrian science and industry as well as international trends in science and technology. They were particularly aimed at co-operation between business enterprises and research institutions from universities and the co-operative sector.

In its strategic recommendation to the government regarding the use of funds from Action Programme II, the Austrian Council has recommended focusing on the following emerging thematic areas:

- Life Sciences
- Information and communications technologies
- Nano-sciences and nano-technologies, micro-technologies,
- Mobility / Transport / Space / Aviation
- Environment / Energy / Sustainability
- Humanities, arts and cultural sciences

The Austrian Council has thus pursued the goal of initiating a process in which funding will be directed more strongly toward these emerging thematic areas in the

Exports of High-Tech Products as a Percentage of Total Exports

	1993	1998	2003
EU (15 states)	14.7 %	17.6 %	17.2 %
Germany	11.3 %	13.1 %	14.7 %
France	19.2 %	22.8 %	20.4 %
Ireland	27.4 %	37.7 %	29.9 %
Italy	7.7 %	7.4 %	7.1 %
Netherlands	13.5 %	19.7 %	18.8 %
Austria	8.2 %	10.1 %	15.3 %
Finland	9.3 %	19.4 %	20.6 %
United States	25.9 %	28.7 %	26.9 %
Japan	23.6 %	24.6 %	22.7 %

Explanation:
This indicator is calculated as the share of exports of all high-tech products expressed as a percentage of total exports. High-tech products are defined as the sum total of the following product categories: Aviation, computers, office equipment, electronics, instruments, pharmaceuticals, electrical machines and weapons. Total EU exports do not include intra-EU trade.

Source: Eurostat Comext and UN Comtrade

medium term. An initial analysis of how funds from Action Programme II were actually distributed (2004-2006) will soon be available and will form the basis for further discussion on the topic of emerging thematic areas. At the same time, attention will have to be given to new mission-oriented priorities (e.g. security research).

Of course, a stronger focus on international emerging thematic areas must not lead us to neglect traditional Austrian strengths (such as materials and manufacturing processes) in terms of the funding that is made available.

Structural Change Through Start-ups

With some 25,000 new businesses being set up each year, the momentum provided by start-ups makes a substantial contribution to the structural change of the Austrian economy, at least in the long term. Statistik Austria workplace statistics for example show a sharp increase between 1991 and 2001 in the number of companies operating in industries such as IT services (from 1,944 to 10,391), research and development services (from 113 to 483) and enterprise-related services (from 21,844 to 41,379). The above industries are moreover characterised by higher than average growth in employment.

On the one hand, the rapid growth of business start-ups thus has a quantitatively perceptible and stimulating effect on the labour market. On the other, the corresponding thematic orientation of the new enterprises produces structural effects such as an increase in the proportion of research and science-intensive products and services as a percentage of the total domestic supply.

General stimulation for start-up momentum therefore constitutes a cornerstone of medium and long-term strategies to support structural change. The most commonly used instruments are consulting services, assumption of liability agreements and loan schemes offered by the federal government and provinces.

In Austria, the predecessor organisations that have been integrated into the AWS and the FFG have developed a large number of promotion instruments and services that cater for the specific needs of technology-oriented business start-ups. At present, the focus of funding efforts is on the incubation and pre-seed phases, and on the interface to private sources of financing.

Attractiveness of the Research Location

Attracting research-intensive corporate units of foreign companies also plays a role in structural change. Austria has become an extremely attractive location for research and development activities. This is evident from the higher than average share of research and develop-

ment carried out in Austria that is financed from abroad (approximately 20 percent). A strategy to safeguard Austria's status as a centre of research and development should certainly also include targeted measures to encourage the central research units of multinational corporations to come to Austria.

THE AUSTRIAN COUNCIL RECOMMENDS

Indirect Funding:

- the Austrian Council will initiate a working group process to optimise the system of indirect funding, both with regard to the portfolio and the processing procedures. An evaluation of the impacts of indirect funding measures should be initiated by the ministry responsible.

Direct Funding:

- funding for the FFG budget should be raised by approximately nine percent annually in line with the increases in overall funding for R&D needed to achieve the Barcelona goal. There should be an above-average increase for the general programmes. Budget increases as a result of programmes being taken over will not be taken into account.

Start-up Momentum:

- previous schemes to stimulate start-up momentum should be secured on a long-term basis and the interaction between existing schemes should be continuously improved. These should, after ex-ante verification and risk assessment in co-operation with other participants, handle the programmes autonomously and also deal with instances of damage in accordance with the programme goals.
- programme management should be adapted within the framework of current budgetary requirements. It should be consistently sourced out to the funding agencies.
- internationally attractive fund structures for private equity and venture capital should be established as quickly as possible.

Headquarters Strategy:

- The budget of the FFG programme "Headquarters Strategy" should be increased. In terms of content, the programme should focus on the sustainable development and expansion of new research areas in which international corporations assume responsibility for R&D.

The Co-operative Sector

The structure of the Austrian economy with its predominance of small and medium-sized enterprises and comparatively small proportion of large companies on the one hand, and the high level of importance of foreign companies for national R&D on the other, confers special importance on the co-operative sector as the link between the university and corporate sectors.

As recommended by the Austrian Council the co-operative sector has therefore seen above-average development since 2001 involving major structural changes. Such structural changes included the development of the competence centres, the reorganisation of the Ludwig Boltzmann Association and the above-average growth of the Austrian Academy of Sciences and the Christian Doppler Research Association.

In 2004 the entire co-operative sector achieved a spending volume of approximately EUR 720 million compared to EUR 530 million in 2000. This represents an annual growth rate of almost nine percent per annum.

Co-operation between Science and Industry

Many empirical studies on corporate innovation behaviour show that co-operation with external partners significantly contributes to the success of innovation projects. The EU Community Innovation Survey (CIS 3) showed that approximately one fifth of all Austrian companies involved in innovation enter into agreements for innovation co-operations with other institutions.

In the majority of cases, suppliers – for example of equipment, software and other input materials – are active as co-operation partners, and in one out of two co-operations, competitors or companies from the same industry are involved. At the same time, co-operation partners for some 45 percent of the co-operating companies are from the science and education sector. Universities, co-operative research institutions and Fachhochschulen therefore play an important role in the co-operations.

Inter-sectoral co-operations, i.e. those with partners from science and industry, are increasingly shaping the country's innovation culture. Differences in the inter-sectoral co-operation behaviour of companies can be identified depending on factors such as the industry involved, the size of the company, workforce qualification level and research intensity. A survey of companies in Austria that operate internationally showed that the intensity and level of activities in research, development and innovation correlate with

- the frequency of participation in strategic co-operation programmes run by the federal government (competence centres, CD Laboratories),
- the scope of research contracts awarded to players in the higher education sector, and
- the extent of other co-operations with universities, Fachhochschulen and non-university research institutes.

Optimising the transfer of knowledge from science to industry through various channels (e.g. publications, training, research co-operations, academic spin-offs and business start-ups) has formed a key area of domestic RTI policy since the late 1990s.
In the view of the Austrian Council, improvements in the area of inter-sectoral co-operation must remain a political priority in coming years. New stimuli for the exchange of knowledge should be developed, especially along the two following strategic lines of action.

Co-operation in Projects

RTI policy attempts to improve conditions for the exchange of knowledge and foster their joint development by players from science and industry date back to the 1980s. During this establishment phase, which

lasted until the late 1990s, the emphasis was on the funding of cross-sectoral co-operations according to the bottom-up principle.

In the meantime, co-operations between science and industry now account for some 22 percent of the projects submitted within the framework of FFG General programmes. In 2004 inter-sectoral co-operation with partners from the university sector could be identified at the application stage of 191 projects that were awarded funding. A total of EUR 45.2 million in funding was available for these co-operation projects, the equivalent of just under 20 percent of the funding volume.

The successive expansion of thematic key areas since the late 1990s has also favoured the trend toward inter-sectoral co-operation in R&D projects. The project topics are frequently in areas that require access to scientific knowledge and the results of basic research. In the experience of the AWS and FFG this is particularly true of initiatives in biotechnology, ICT and nano-technology.

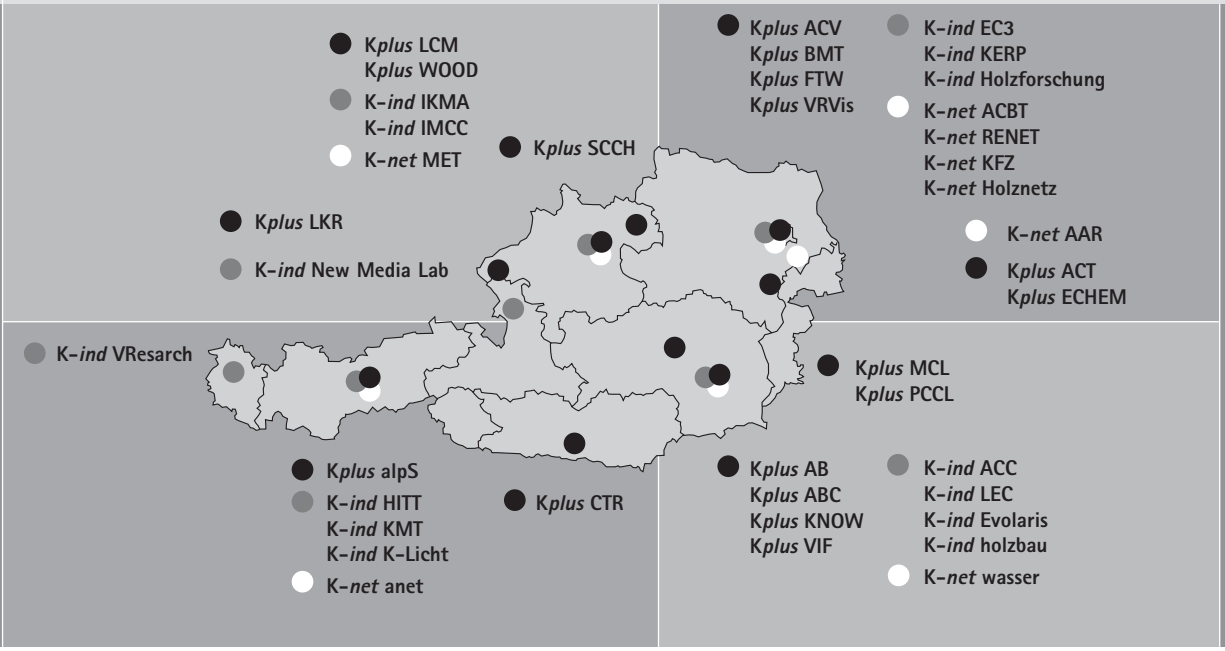
The recent addition to the funding portfolio of programmes to transfer knowledge from science to industry – the Translational Research programme of the FWF and the bridging programme of the FFG under the joint title BRIDGE – will also have a stimulating effect on inter-sectoral co-operations in coming years (if funding is increased). While the Translational Research programme basically prepares industrial applications through research projects at universities, it is co-operation between partners from science and business that plays a major role in the projects funded by the bridging programme. Work concentrates on the further joint development of basic research potentials and applied research potentials.

In the view of the Austrian Council, short-term demand-oriented co-operation between science and industry in joint R&D projects is adequately covered by existing funding schemes. The frequency of co-operations will certainly increase, hence the budgetary requirement is also set to increase.

Strategic Partnerships between Science and Industry

Many co-operations between business enterprises and scientific institutions go beyond the short time horizon of a single R&D project. They then possess a strategic component, because the participating partners not only develop ad hoc problem solutions, but also open up per-

Competence Centres in Austria



Source: FFG-Jahresbericht 2004

manent channels for the regular development and exchange of knowledge. In recent years, Austrian RTI policy has expanded the area of strategic, inter-sectoral partnerships, above all by introducing the competence centres programmes (Kplus, K-ind/K-net). Furthermore, funding for the establishment of Christian-Doppler laboratories has been successively increased.

The establishment of competence centres with mixed participation by science and industry has aimed on the one hand at creating critical masses of research competence in freely selectable thematic areas in order to achieve internationally competitive results. The other objectives were to support the universities in focusing research activities, to encourage industry to engage in more strategic R&D and to improve links between the two systems, particularly through the Kplus programme. International experts unanimously agree that the competence centres initiative has helped change the culture of co-operation between industry and science in Austria:

- Some 450 business enterprises are incorporated in the 18 Kplus- and 22 K-ind/K-net centres and networks with a time horizon of seven years. It has thus been possible to successfully establish co-operation with a long-term focus.
- With a total workforce of more than 1,500 researchers, the deployment of resources is on a substantial scale for Austrian conditions.
- The main goal of broadening and formalising co-operation between industry and science is deemed to have been achieved. Important bridges have been built between the sectors as a result of the joint definition and processing of research topics.

The competence centres were conceived for a limited period. The very first centres to be founded are now reaching the end of their lives. However, an assessment has impressively documented the importance and continuity of the remit of the competence centres programmes.

The Austrian Council has taken the logical step of asking the FFG to draw up a comprehensive strategy for the further development of the competence centres programmes, which

- optimises the hitherto existing programmes and programme lines.
- includes incentives to increase the bundling and competence focus of the existing portfolio and
- specifically promotes the development of competence centres with a critical dimension and with particular claims to scientific quality, a high degree of relevance for industry and a strong international orientation.

To this end, a programme structured on different lines and with appropriate funding instruments will be created both for projects and competence centres/networks of various sizes with funding periods and funding intensities tailored to the project type. The programme will focus across all lines on medium to long-term pre-competitive research and development that has a high scientific quality and relevance to industry, and which is financed jointly by business enterprises, universities and the public sector. The situation is slightly different with regard to the laboratories of the Christian Doppler Research Association, which promotes strategic collaboration in application-oriented basic research. Although the CD laboratories, like the competence centres, function as inter-sectoral research centres with highly qualified scientists at university and co-operative research institutes, the laboratories are on a smaller scale, and it has become established practice in the programme (that was introduced in 1989) to close the laboratories after a period of seven years.

The Austrian Academy of Sciences

The Austrian Academy of Sciences (ÖAW) is one of the mainstays of the Austrian science system. The Austrian Council is currently engaged in a constructive dialogue

of reform with the Academy, with the main aim being its strategic orientation as an institution of excellence in the science system acting in close co-operation with and in complement to the universities. The statutes were therefore recently amended to meet the demands of a modern innovation system and the extension of the scientific and entrepreneurial quality-assurance mechanisms. It is now vital to ensure appropriate global budgeting with secure medium to long-term financial planning, the prerequisite for expanding projects such as the Institute of Molecular Biotechnology (IMBA) and the Center of Molecular Medicine (CeMM).

Research Institutes

Private and non-profit making research and development institutes such as the Austrian Research Centers (ARC), the co-operative research institute ACR, the research institutes Joanneum Research, Salzburg Research, Upper Austrian Research and similar institutions constitute a major element of the co-operative sector.
The reorganisation of established research institutes – such as the institutes of the Ludwig Boltzmann Association – is also a step along the way to establishing competence visible at an international level.

The Institute of Molecular Pathology (IMP) is a successful example of an entrepreneurial initiative in the field of co-operative research.

Furthermore, in the field of bioengineering research the institute Medical Genome Research and System Biology (IMGUS) is being established. This will be one of the world's three leading institutes when it takes up its work.

This segment of the co-operative sector has high priority for the Austrian innovation system, as it is an area characterised by extremely close co-operation between industry and science and a high level of SME participation.

>> THE AUSTRIAN COUNCIL RECOMMENDS

- consistent continuation of the growth strategy for the co-operative sector set out in the National Research and Innovation Plan 2002.
- the competence programme of the FFG should be specified in detail and implemented as quickly as possible. Appropriate funding on a progressive scale should be provided.
- the merger of the Translational Research Programme of the FWF with the bridging programme of the FFG under the joint title of BRIDGE should take place under the overall control of the FFG with increasing funding levels.

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The Strategy of Excellence

The next milestone on the road to achieving the three percent target will be the conception and implementation of a strategy of excellence at all levels and in all performance sectors of the national innovation system. This should be aimed in equal measure at raising the overall quality of research in Austria and facilitating cutting-edge international-level research on a larger scale in Austria. This is designed to raise Austria's quality as a centre of technology and improve its international competitiveness.

A central nodal point of this strategy is the planned university of excellence, the Austrian Institute of Advanced Science and Technology (AIST), which should attract top researchers from both Austria and abroad. To realise this objective, an integrative model with a highly developed network character and physical crystallisation point should be selected. Networking with existing universities and research institutes should be facilitated using suitable instruments. The new institute should also have a positive impact on existing establishments. However, once it has been founded, the AIST must prove itself in competition with other research institutes and groups. Likewise, from the very outset, it should make a point of building up long-term co-operations with European industry. The share of the funding provided by the public purse should be financed exclusively from additional funds, without recourse to current budget allocations.

Within the framework of the strategy of excellence, a number of additional top research institutes and research networks – both basic and application-oriented - should be created in all performance sectors by 2010. New types of centres of excellence are one of several possible forms for these institutes.

Top-level researchers in a number of specialist fields that are of importance for the Austrian economy should be employed at these institutes. In addition to the above-average quality of the human resources with one or several internationally renowned top researchers, the centres of excellence must attain an internationally recognised research ranking commensurate with their discipline (among the top ten in the world) and thus acquire a critical dimension. The quality of the staff and the research facilities should ensure that they are able to perform an important function within the scope of the NIS on a partnership basis, insofar as there should be demonstrable networking with Austrian business enterprises and scientists.

In order to fulfil this important role of cutting-edge research in Austria, these centres of excellence should receive a basic financing package to be provided by the federal government and the provinces, as well as growth funding that should enable them to achieve internationally recognised research results, and achieve and maintain the necessary critical dimension. The remaining financing requirement of approximately 50 percent should be covered by outside funding – i.e. by contracts from industry, projects from the EU Research Framework Programmes and the public purse – in order to achieve networking at the national and European level.

>> THE AUSTRIAN COUNCIL RECOMMENDS

Strategy of Excellence

- the concept of a university of excellence titled the Austrian Institute of Advanced Science and Technology (AIST) should be implemented within the framework described above.
- just as the AIST should form a crystallisation point for cutting-edge research by national and international scientists, other research institutes from all performance sectors should also be able to develop into centres of excellence.
- to support the development of several such centres of excellence, a concept for a strategy of excellence covering all sectors of performance should be drawn up.

International Orientation

Since the Lisbon process was started in 2000, a European Research Area has begun to emerge strategically steered by the member states together with the European Commission. The European Union is pressing ahead with the co-ordination, joint implementation and opening of national and regional policies and promotion programmes, mainly through the ERA-NET programme line that was developed under the Sixth Framework Programme.

The European Research Area

The joint implementation and opening of national and regional research programmes through ERA-NET plus and the application of Article 169 should be stepped up even further under the Seventh Framework Programme. In the Sixth Framework Programme Austria is one of the most active and successful countries in this cross-border co-ordination of funding programmes. The further advance of the integration process in the area of research requires active participation also on the part of Austria.

The developing European Research Area also involves close collaboration between the EU and other research organisations (e.g. European Space Agency, EUREKA, COST). All these European research structures are supported by national measures, which in future must be co-ordinated with one another to better effect.

The creation of the European Strategy Forum on Research Infrastructures (ESFRI) is a correct step in moving towards greater co-operation between research infrastructures in Europe, and must now be followed by the medium and long-term planning of research infrastructure projects in Europe.

Frontier Research

A broad scientific basis is necessary to nurture growth and competitiveness. The boundaries between national and European research policy are becoming blurred here as well. In the Seventh Research Framework Programme, the newly created European Research Council will provide for the promotion of outstanding teams of top researchers from all member states. This European Research Council is conceived as a largely independent institution with responsibility for frontier research at a European level. The Austrian Council welcomes the establishment of a European Research Council to promote excellence in European frontier research, but notes, as already formulated in the Austrian position paper, that there must be no substitution or reduction of national funding for basic research as a result. National funding must in fact be increased. Generally speaking, this principle holds true for all areas of national and international RTI funding.

International Organisations

Membership of international organisations with a research relevance is all the more important for small

Structure of the Seventh EU Research Framework Programme

7th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (2007 to 2013)			
CO-OPERATION	**IDEAS**	**PEOPLE**	**CAPACITIES**
> Health > Food, Biotech, Agriculture > ICT > Nano, Materials, Production Technologies > (Non-Nuclear) Energy > Environment > Transport (incl. Aeronautics) > Socio-economic, Sciences, Humanities > Security and Space	> Measures to promote frontier research in all areas > Implementation through an autonomous European Research Council	> Initial training of researchers > Life-long learning and career development > Industry-academia partnerships and pathways > International Dimension > Specific actions	> Research Infrastructures > Research for the benefit of SMEs ? > regions of knowledge > Research Potential > science in society > International Co-operation
Joint Research Centre JRC – non-nuclear			
7th Framework Programme of the European Atomic Energy Community (Euratom 2007–2011)			
> Fusion Energy Research	> Nuclear Fission and Radiation Protection	> JRC Measures in Nuclear Energy	

Source: European Commission

countries like Austria, as alone they are not in a position to achieve the essential minimum dimensions or provide the necessary infrastructures. To ensure that cutting-edge scientific research in the field of observation-assisted astronomy and astrophysics will remain possible in Austria in the future, the Austrian Council has recommended the BMBWK start negotiations for Austria's accession to the European Southern Observatory (ESO). It must be proven that Austria stands to benefit from all international and co-operation projects in which it participates.

Trans-National Co-operations and Networks

The potential in terms of innovation partnerships for Austrian business enterprises has increased greatly in recent years due, among other things, to the expansion of the EU to the east. Many corporate innovation networks now cross borders on a supra-regional and, increasingly, also international scale. Enterprise-related programmes therefore support co-operations, consortial projects or the development of trans-national networks between innovative Austrian companies, intermediary organisations and innovative enterprises from Central and Eastern Europe.

There are numerous bilateral agreements in place to promote the mobility of researchers within the framework of bilateral scientific projects with the aim of stepping up collaboration in science and technology.
However, at the present time there is no identifiable consistent national strategy or research focus nor any that have been co-ordinated at a European level. In the European Research Area, Austria's bilateral and multilateral research, technology and scientific relationships with third states can no longer be separated from those of the EU. Improved co-ordination and coherence between the external relationships of the EU and those of Austria in the area of research is needed. Austria should make a point of becoming active in key regions, where Austrian research, education and economic interests are supported by European strategies (e.g. North America, China, India, West Balkans).

International Orientation

>> THE AUSTRIAN COUNCIL RECOMMENDS

Consulting and Support:

- targeted action should be taken to support the active participation of Austrian researchers from science, research and industry in relevant European and international programmes.
- incentive and additional financing should therefore be reorganised and adequately funded.
- the range of consulting services about the diverse regional, national and European funding schemes must be optimised, and national and regional consulting services synchronised to a greater extent. At the provincial level, consulting services should also include other regionally relevant EU programmes in addition to the Research Framework Programme.

7th Research Framework Programme:

- in view of the European development toward greater co-ordination and the mutual opening of national programmes, a national strategy should be developed that will support successful participation. This should define the areas in which Austria should take part in ERA-NET plus and Article 169 programmes and specify what framework conditions are needed.

International Positioning:

- networking of the Austrian Science Fund and the funding agencies with other national research promotion agencies at the European level should be stepped up.
- participation in European research infrastructures should be increased on the basis of a strategy, whereby the scientific benefit should be demonstrated.
- a strategy should be formulated to define the countries and regions on which Austria will concentrate its research, educational and economic interests. This strategy must be geared to the EU and the pan-European strategies.

The Regional Dimension

In times of rapid technological change and economic globalisation, regions are of particular importance for the innovative and competitive capability of entire national economies. Regionally anchored players transform new knowledge, turning it to use for local conditions. By providing co-ordinating support for co-operation between such players in innovation networks, a targeted regional development policy can initiate regional learning processes, from which new competence fields evolve.

In this manner regional clusters help achieve the higher-order goal of technology policy, namely scientific and technological innovation to safeguard economic and technological competitiveness. It is therefore a logical consequence that a policy to foster national competitiveness will take into account the spatial structure of the economy and try to influence it for its own purposes. Austria has assumed a pioneering role in Europe in this area.

Interaction Between Federal Government and the Provinces

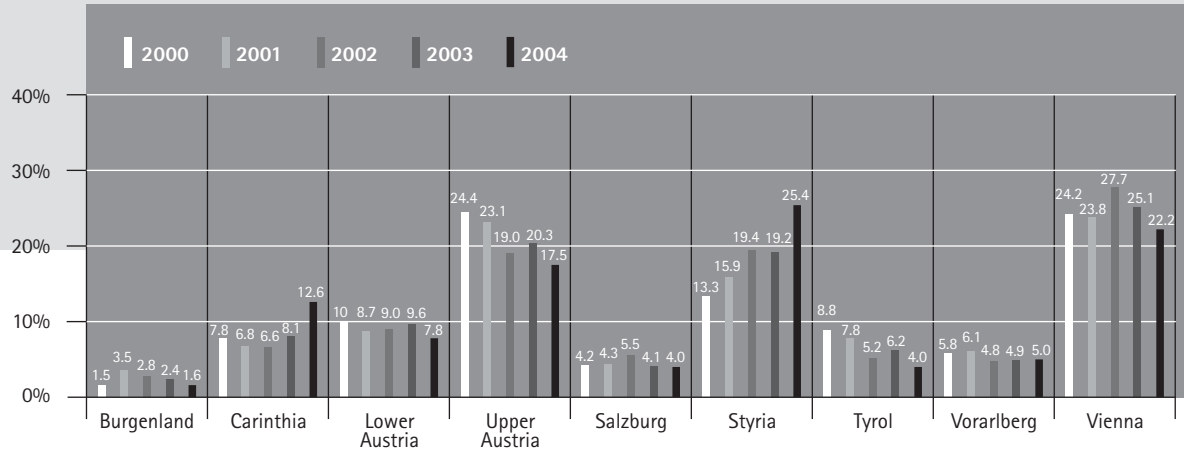
In recent years the provinces have increasingly set research, technology and innovation policy priorities of their own. This has manifested itself above all in a marked budgetary increase as well as in the growth of appropriate intermediary infrastructures and the number of individuals employed in this sector. Most provinces now pursue a differentiated technology policy that is explicitly tailored to regional requirements and which includes the following elements:

- Co-financing of basic funding and structural programmes
- Financing of foundation professorships
- Research promotion programmes focusing on specific key areas
- Expansion of RTI infrastructure by means of technology and research parks
- Cluster and innovation programmes (e.g. innovation assistant)
- Start-up and growth financing
- Expanding research competence at Fachhochschulen

Increasingly independent policymaking on the part of the provinces calls for a clear division of responsibilities between federal government and the provinces. In the

Percentage Levels of Funding from FFG General-Programmes by Province

Source: FFG



case of programmes with regional objectives, federal activities should concentrate on measures that complement the respective provincial activities. In particular, this applies to the portfolio of technology transfer measures.

EU Structural Funds: New Challenges

Greater emphasis will be placed upon research and development within the scope of the reform of the EU Structural Funds. For Austria, it is most notably the target category "Strengthening Regional Competitiveness and Employment" that will be of importance in the forthcoming programme period 2007 to 2013. Past experience has revealed the following implications for the effective implementation of this goal:

- Strategic concentration: The EU is likely to release substantially less cash from the Regional Funds for Austria in future. When drawing up programmes for the next period a strategic concentration upon a small number of co-ordinated measures will therefore be required.
- Optimal networking of programmes: For many years Austria has relied on an integrated regional policy. Increasingly scarce EU funds will make it even more important than before to network Austrian funding measures with those co-financed by the EU. The rules for the forthcoming programme period must therefore aim at stronger integration and co-ordination.
- Improvement of networking capability: Most corporate innovation networks now cross-borders at least to some extent on a supra-regional and increasingly also international scale. The potential in terms of innovation partnerships for Austrian business enterprises has increased greatly in recent years due, among other things, to the expansion of the EU to the east. The networking capability, and access to networks of Austrian regions should therefore to be improved in future.
- Less Risk-Averse Funding Logic: Pushing forward research, technology and innovation within the Structural Programmes will require a funding logic that is based more strongly on innovation criteria than in the past.

Fachhochschulen as Network Nodes

Fachhochschulen offer access to research and development to regions and SMEs that are removed from the major university centres. In the technology transfer chain they constitute an important element for the reciprocal exchange of technological and other scientific knowledge between universities and industry and even between individual business enterprises.
The professorate at the Fachhochschulen plays an extremely important role in this respect given its professional

experience in academia and industry. It guarantees effective co-operation between the Fachhochschulen and business enterprises, for example through joint development projects, work experience placements and within the framework of diploma theses. On the whole, Fachhochschulen are competent development partners for industry and should therefore in future be increasingly positioned as the regional crystallisation point of research networks with universities.

Technology and innovation centres also make an important contribution to regional policy in their role as service centres, network nodes and innovation drivers.

THE AUSTRIAN COUNCIL RECOMMENDS

Co-operation between Federal Government and the Provinces:

- a co-operation platform should be set up to co-ordinate federal and provincial activities. This co-operation platform should establish more systematic planning and management of all stages of the policy cycle from need assessment to evaluation from a joint knowledge base

EU Structural Funds:

- in view of the stronger focus upon RTI in the forthcoming Structural Funds period, the aim should be to concentrate on a small number of strategically co-ordinated key areas and measures when drawing up the programmes.
- effective networking of EU co-financed regional funding programmes with national funding activities in terms of programming, operational handling and evaluation must be ensured. This means harmonising the strategic considerations of the individual provinces with one another as soon as possible and integrating them in the appropriate national RTI strategies.

Fachhochschulen and Technology Centres:

- the Fachhochschulen should be increasingly positioned as regional crystallisation points for research networks so that SMEs and regions without universities have access to R&D.

Technology Transfer:

- federal technology transfer programmes should be bundled and systematised on the basis of detailed analysis.
- transfer and network activities at technology centres should be supported, particularly as regards cross-border activities.

Humanressourcen

Austria has seen dynamic development in the demand for and participation in educational processes. Empirical data show that improved access to education has increased the level of education of the population. In an international comparison, Austria performs well in the secondary sector, but suffers from significant weaknesses in tertiary education.

Nevertheless, after a catching-up process, Austria can now boast an adequate supply of research personnel. By expanding the Fachhochschulen in recent years it has been possible to achieve a significant increase in the number of graduates who are qualified for research work.

It is essential that further initiatives be taken to maintain this status. Moreover, the growth in R&D required in connection with the Lisbon process and the need for continuous increases in the quality of the knowledge base places the question of education at the forefront of RTI policy strategies. For this purpose, the Austrian Council has defined recommendations along four lines of action.

Women in Research

In most European Union states, women are underrepresented in research and technology (see fig.), especially in the natural sciences and technological disciplines, in industrial R&D and in executive positions.
The Austrian Council therefore believes it is necessary to continue with gender mainstreaming and the promotion of women in order to achieve equality between the sexes. The inter-ministerial initiative fForte to promote women in research and technology recommended by the Austrian Council has proven itself to be effective and must be continued. Where necessary, gaps, for example in addressing certain target groups, should be closed and the range of measures broadened or supplemented accordingly.
Complementary to this, gender mainstreaming (GM) acts as a general long-term strategy to achieve equality between women and men in all policy areas.

Gender mainstreaming aims to change basic conditions and structures that produce inequality. As a guiding principle of action for RTI policy, GM means stimulating gender-relevant research and evening out the disparate levels of participation by men and women in all areas.
Gender mainstreaming and efforts to promote women are not tasks that are solely incumbent upon the federal government, but upon all players in the innovation system. The Austrian Council therefore calls upon them all to take appropriate action in their areas of competence.

Promoting Mobility

The mobility of people as carriers of knowledge is extremely important for the dynamic development of R&D. If Austria wishes to expand its scientific capacities, it must attract top scientists to the country and at the same time boost the willingness of its own researchers to work abroad. Specially tailored instruments must be provided and obstacles to mobility removed in order to meet this goal.

A number of barriers to cross-border mobility of researchers have already been eliminated by improvements to the laws governing aliens. Researchers from third countries for example now receive residency permits regardless of quotas. Positive mention should also be made of the "Researchers Mobility Portal Austria" website set up by the BMBWK as part of an EU initiative. Differences in national insurance and pension systems however, continue to constitute obstacles to mobility in Austria as in other EU states.

As shown by a survey conducted by the Austrian Council and the working group "Grant Reform" in 2004,

Austria promotes the international mobility of students, doctoral and post-doctoral students to a high degree. Together, the BMBWK, BMVIT and BMAA spend just under EUR 30 million each year on 50 grant programmes, which however, suffer from structural deficiencies (18 processing agencies) and duplicate and/or overlap with one another in terms of content. The complementary funding from the EU envisaged under the 7th Research Framework Programme will also contribute to the improved financing of grant programmes. The Seventh Research Framework Programme might allow national grant programmes to be topped up with community funds provided these programmes have a clear European dimension.

Mobility between sectors must also be increased. In addition to the current programme "Scientists in Industry," more must be done to promote interaction between the sectors. Seconding scientists to industry for a fixed period while giving them a right of return to their universities could contribute to this. Permeability between universities and Fachhochschulen should also be increased.

Learning as a Lifelong Task

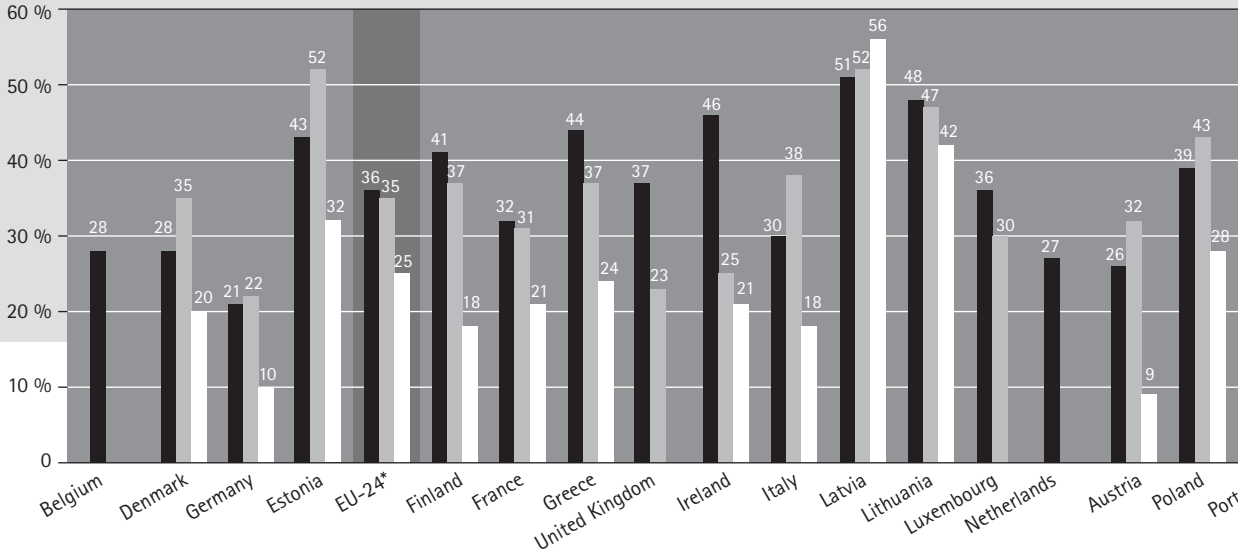
The concept of lifelong learning merges previously highly segmented areas of education and integrates preschool education, compulsory schooling, higher education and vocational further training to a form a coherent and, above all, permeable overall system.

However, systemic weaknesses hinder the optimum structuring of lifelong further education. Although the Austrian education system offers incentives for vocational training to a high percentage of Austrian young people, with the exception of the Fachhochschulen, there is a lack of mechanisms to continuously identify demand for new training courses and vocational profiles and then translate them into appropriate programmes. Moreover, the system of recognition of qualifications concentrates almost exclusively on first qualifications, which are usually acquired early in life. In particular, individuals who have completed apprenticeships find it difficult to continue training at a higher educational level.

Public Awareness

For four years the initiative "innovatives-oesterreich.at" has provided a platform for dialogue on the part of the research community with the general public, the aim of which is to increase understanding of the benefits of innovation, research and technology and encourage innovation.

Percentage of Women Employed in R&D
(by sectors: universities, state, business enterprises)



The campaign is sponsored by the Austrian Council, the BMBWK, the BMVIT and the BMWA and supported by the scientific community and the social partners. The first phase of the programme started in 2002 and finished in 2004. In phase II (2004–2006) the aim is to improve the effectiveness of the campaign still further (namely through an attendant evaluation that will monitor the campaign for the first time), achieve greater integration of the individual elements of the campaign and the implementation of internationally proven formats.

>> THE AUSTRIAN COUNCIL RECOMMENDS

Human Resources

Women in Research:

- the implementation of gender mainstreaming (GM) in all areas of RTI policy
- the fForte initiative must be continued and any gaps closed.

Mobility:

- the percentage of university graduates with experience abroad should be increased from approximately 30 percent at present to 50 percent.
- the Austrian Council's recommendation of January 2004 must be implemented in order to efficiently restructure the grant programmes.

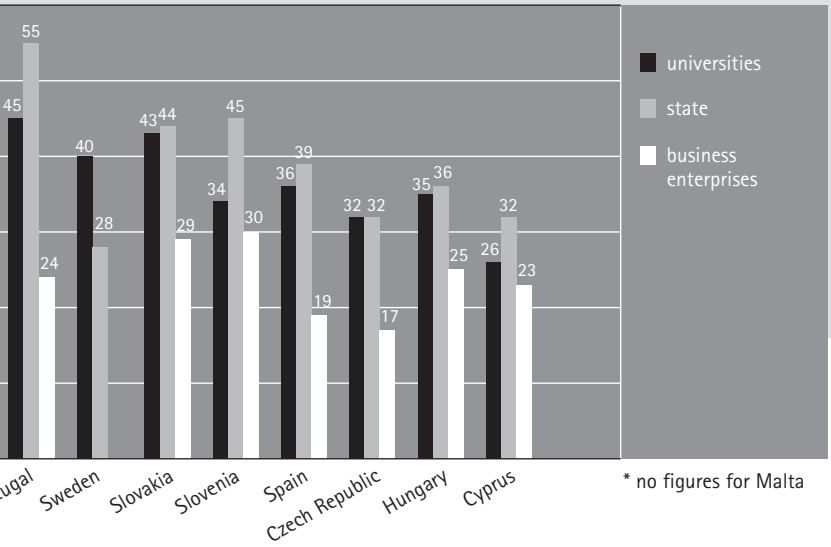
Lifelong Learning:

- a strategy for Austria to promote lifelong learning should be developed jointly with the social partners, in order to implement positive international best practice examples in Austria.

Public Awareness:

- the initiative "innovatives-oesterreich.at" should be continued until 2010, going beyond the second campaign that will run until 2006.

Source: Eurostat, S&T statistics, DG Research, WiS database



* no figures for Malta

The State as a Driving Force

The state is crucially important within the innovation system and can influence the momentum of innovation processes in a variety of ways. Its role as the shaper of the framework for market processes – by setting standards and norms, defining intellectual property rights and laying down rules for competition – has already been underlined in the Chapter "General Framework and Points of Reference."

However, the public sector also has an enormous demand potential. Public sector orders now account for between five and six percent of Austria's total gross domestic investment of some EUR 50 billion p.a. Neither does this figure include other state expenditure that falls into the category of consumption. In addition to construction measures, which account for the largest share, public investments are also used to purchase equipment and thus lead to the use of new technologies in the fields of education, health, security and administration.

This makes clear the importance of RTI-relevant measures in public procurement. The new Lisbon Action Plan calls upon the member states to "open up the public procurement market to a greater extent," and thus support the development of technology and innovation through public procurement.

Research and Innovation with a Double Dividend

Research and development are expected to make important contributions to overcoming the challenges that face society such as climate change, environmental pollution, ageing populations, food and health or social cohesion. Such problems are becoming increasingly important on the agenda of RTI policy priorities.
The Austrian Council has already established research to satisfy social needs as an RTI policy priority in earlier strategy documents. It regards research that is geared to solving problems from the perspective of a "double dividend," because in practice such RTI activities often simultaneously strengthen the knowledge base and competitiveness by generating new scientific knowledge, innovative methods and products. Two examples illustrate this double dividend.

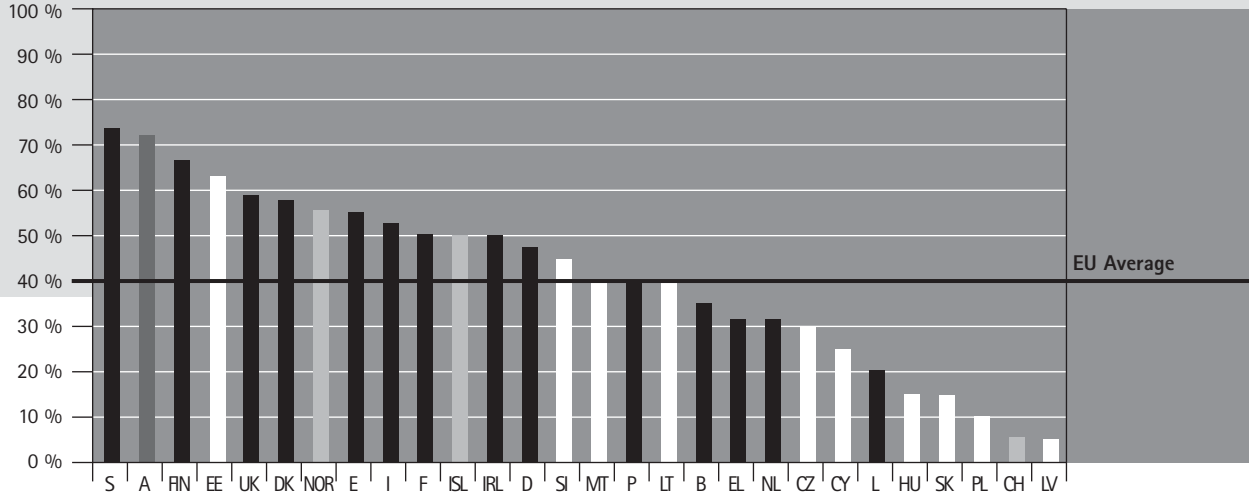
– Sustainability Research

In view of global trends such as climate change, increasing consumption of raw materials and energy sources, and global demographic trends, sustainability has beco-

Online Availability of Public Services

Austria is a European leader (based on 20 basic services for citizens and companies) in terms of the range of e-government services.

Source: Capgemini on behalf of the European Commission (October 2004)



me a key social and political issue. Policymakers have taken up this challenge and formulated strategies for sustainable development at both the national and international level, whereby research and innovation are assigned a central role in the development of innovative, sustainable solutions.

Austria is a good example of the effectiveness of the double dividend. Seen by the Austrian Council as a demonstrable strength, research for sustainable development has produced major advances in areas such as environmental technology and renewable energy systems. Austrian enterprises that exploit the results of this research commercially have been able to position themselves extremely successfully against the international competition.

In order to strengthen the emerging thematic area "Research for Sustainable Development" and position it internationally, the Austrian Council has created the FORNE initiative. This framework strategy developed by the BMBWK, BMLFUW and BMVIT together with the Austrian Council defines joint goals for Austrian sustainability research, deals with methodological and strategic aspects and describes the co-ordination between the Austrian sustainability research programmes.

- Security Research

The topic of security as an issue that concerns the whole of society poses new challenges to research and technology development. Over the next few years, the EU will respond in the Seventh Framework Programme for RTD with investments in civilian-oriented security research. In the process it will create a new cross-sectional material that spans many areas of technology.

This development will create new tasks for Austrian research and technology policy. A national programme must take adequate account of the planned EU programme for security research, while at the same time giving due consideration to the specific characteristics and strengths of Austrian research. The main emphasis will be upon security-relevant, technology-oriented civilian research themes in Austrian strength areas, primarily in pre-competitive research. In order to achieve an optimum solution for this new social problem, the humanities and social sciences must form an integral element of the programme.

Innovations in Administration

The reform and modernisation of administration within the scope of New Public Management concepts (NPM) offers a further opportunity to link RTI policy objectives with other political goals. The reforms carried out in recent years were aimed at reducing the costs of providing public services while maintaining or raising existing quality standards. E-government and contracting in the energy sector are two examples of the contribution that technical and organisational innovation have made to administrative modernisation.

- **E-Government: Austria among the Front-runners**
  The Internet boom and the upsurge in political initiatives since the mid 1990s designed to create an information-based society have led to an increase in the range of modern online applications offered by public administration. These were accompanied by opportunities to cut costs in the judiciary and administration. With 74 percent of business enterprises contacting the administrative authorities via the Internet, Austria is among the front-runners in the EU in this respect (see fig.).

- **Contracting: Lower Costs, Greater Efficiency**
  Modern methods of administration stimulate innovation. The most impressive example of this is contracting in the area of building management with the aim

of making more efficient use of energy. An external contractor bears the costs and risks of investment and at the same time is responsible for installation of the necessary systems. Payment for the contractor comes from the energy costs that are actually saved. The contracting campaign by the BIG, BMWA and BMLFUW demonstrates that this innovative instrument not only reduces costs, but can also make a massive contribution to achieving climate protection targets and creating employment.

THE AUSTRIAN COUNCIL RECOMMENDS

Intellectual Property:

- additional incentives to safeguard and commercially exploit research results must be created for the entire technology transfer chain.
- the syllabuses of universities and Fachhochschulen must be expanded in the second half of degree courses and in doctoral courses (particularly in technical disciplines) to include basic seminars on safeguarding property rights in the area of research.
- funding for technology transfer facilities and incubators should be increased.

Research with a Double Dividend:

- the FORNE strategy for sustainability research should be implemented and provided with the necessary resources.
- the national programme on security research should be developed still further; a first call should be carried out in the start-up phase and documented by a report.

Innovative Administration:

- contracting should be expanded, particularly at the municipal level, and awareness for this innovative form of administration increased.
- practical e-government services should be expanded all over the country, with special attention being given to user-friendliness and social inclusion.
- the technical interoperability of the modules for e-government must be established, particularly at the European level (e. g. digital signature for Europe etc.).

The Funding Portfolio

The organisation of Austrian RTI policy is still highly complex and split between several ministries. The Austrian Council reiterates its view that the main responsibilities should be concentrated at two ministries, with a clear definition of interfaces and co-ordination competences.

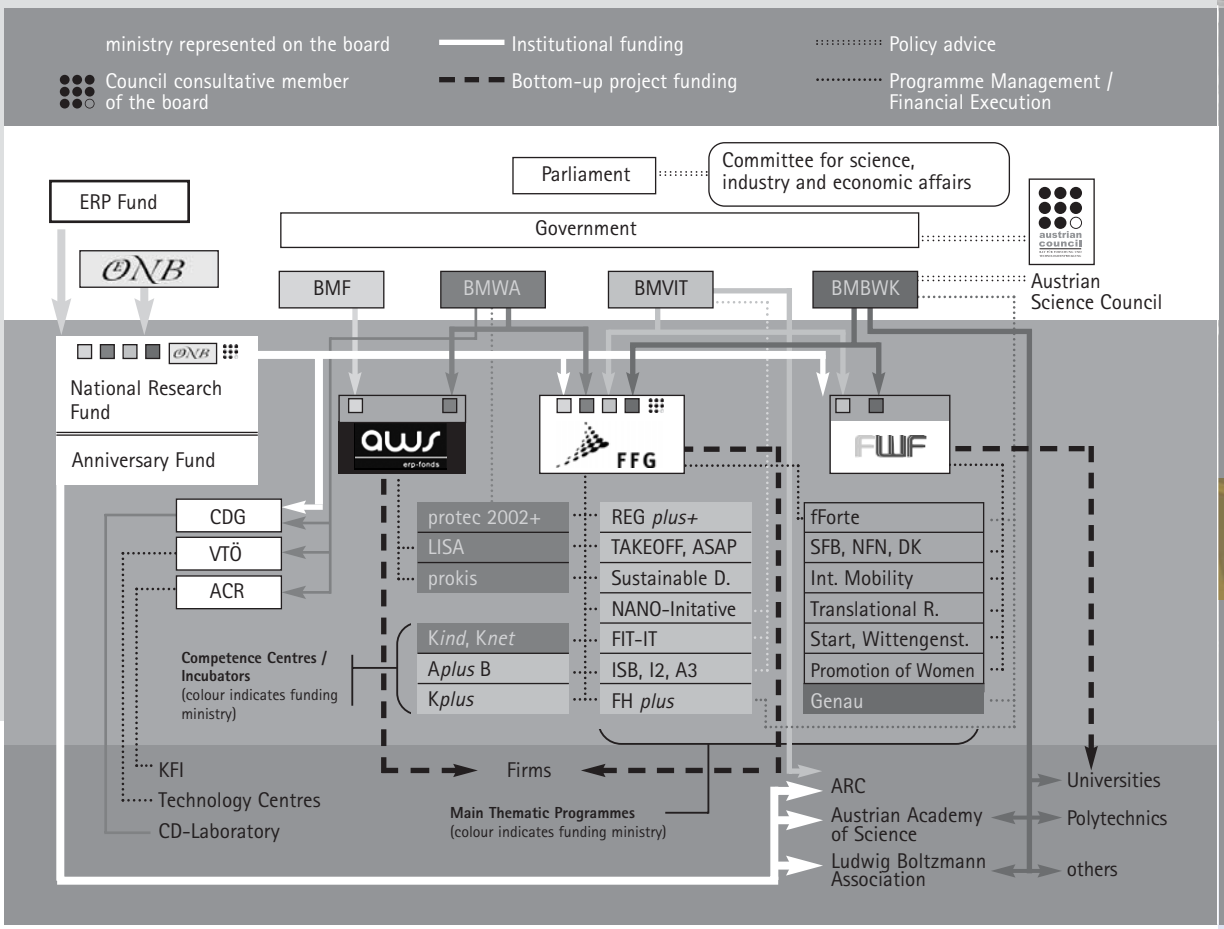
Moreover, the organisation of Austria's RTI policy is highly federalised. In recent years, almost all provinces have set clear accents in the field of RTI. The proceeds of privatisation have been increasingly invested in forward-looking projects. The development in financing has been accompanied by the establishment of new funding structures (see Chapter "The Regional Dimension").

In contrast, distinct progress has been made at the level of the funding agencies. The founding of the FFG has significantly improved and simplified the funding structure. Further progress could be achieved in the immediate future by optimising collaboration between the FFG, FWF and the AWAS and with the provincial funding agencies. In the longer term, there should be intensive discussion regarding further steps toward institutional concentration.

Perspectives of the Overall System

The federal funding portfolio has developed extremely dynamically in recent years. Institutions and bottom-up funding have been supplemented by large numbers of programmes and instruments; the funding system is now highly differentiated and funding gaps have been closed, most recently by the BRIDGE programme. One negative effect of this is the fragmentation of the funding landscape at the programme level, so that applicants for funding are now confronted with high costs for obtaining information. Sub-critical programme fun-

The Austrian Research Funding System



Source: Arnold, et. al, Evaluation of the Austrian Industrial Research Promotion Fund (FFF) and the Austrian Science Fund (FWF), Synthesis Report, 2004 modified by Technopolis.

ding and the mixed structure of programme management (in addition to the ministries, outside independent bodies are also frequently responsible for management) are other unsatisfactory aspects of the current situation.

To solve these problems, efforts should be made to simplify the funding portfolio and develop an integrated overall concept in keeping with the ideas of portfolio management. Portfolio management means viewing the RTI programmes from the perspective of the overall system. Decisions on alternatives to existing programmes should not focus on improving individual programmes or parts, but on the overall system of programmes. The forthcoming reorganisation of the structural programmes to promote co-operative research in the FFG is an important first step toward portfolio management.

Portfolio management also means adapting existing programmes, developing new ones and weighting individual programmes by content and financing within the overall spectrum. In the view of the Austrian Council, this is the responsibility of the funding agencies within the framework of strategic-policy requirements. In the medium term, the ministries should withdraw from detailed programme development and the funding of individual programmes and transfer this responsibility to the funding agencies.
Furthermore, portfolio management must also provide targeted support for the active participation of Austrian research in international and multi-national programmes, such as the Seventh Research Framework Programme for RTD or the Competitiveness and Innovation Framework Programme (CIP), whereby the needs of first-time applicants, SMEs, research institutes and individual researchers should be accommodated.

Monitoring and Evaluation

Effective strategy and programme development must be able to build upon an integrated body of relevant, comparable and continuously updated data on the funding system. As studies and evaluations have shown, there is at present no such body of data for either direct or indirect research funding. The development of such a monitoring system is therefore absolutely vital, and in keeping with international trends the Austrian Council issued a recommendation to this effect in April 2005. The Austrian Council has already taken a first step in this direction within the scope of the Action programmes in the form of standardised programme descriptions and regular reports from the ministries and other players.

In the Austrian Council's view, evaluation and monitoring have a central function in the further development of national innovation systems. Together with the Platform for Research and Technology Evaluation, the Austrian Council seeks a greater number of better and more transparent evaluations that will benefit the strategic planning of R&D policy in Austria. The aim is achieve a new culture of evaluation in co-operation with the Austrian decision-makers responsible for technology and research policy.

Optimisation of the Funding Mix

In the view of the Austrian Council the overall funding system and the effectiveness of the instruments should be borne in mind when developing or merging new programmes. At the same time, the instruments should focus more on covering the risks of radical innovation than they have done in the past. Funding instruments should be used in a targeted and co-ordinated manner, and consideration should be given to the interaction of the instruments to be used (grants, loans, assumptions of liability etc.).

Non-financial aid instruments are still relatively under-

developed in the Austrian innovation system and should be strengthened. Publicly assisted access to professional databases (e.g. those already realised in the TecNet/AWS) provide small companies and non-university research teams with low cost access to information that considerably facilitates innovation management and which can help eliminate undesirable developments at an early stage.

Setting Priorities

One weakness in the current national RTI funding system is the excessive number of discrete separate top-down funding programmes. The Austrian Council therefore proposes bundling the portfolio of thematic programmes while defining lines of action for a limited term. Instead of defining independent Action programmes involving in some cases small individual budgets and consequently complicated administrative processes, the Austrian Council holds the view that it is necessary to identify and develop individual thematic priorities which above all build on the trends recognisable in the basic programmes.

The possibilities for formulating such funding programmes are provided for under the regulations of EU competition law and do not have to be invented from scratch. Additional budgets are solely necessary for drawing up information material and creating the necessary awareness measures, not for the administrative level itself.

>> THE AUSTRIAN COUNCIL RECOMMENDS

The Funding Portfolio

Distribution of Competences and Tasks:

- the bundling of RTI competences should continue – in particular by focusing on two ministries.
- taking into account the principle of a clear division between the strategic policy level and the operational level, optimum use should be made of the possibilities to divide up tasks between the ministries and funding agencies.

Funding Portfolio and Instrument Mix:

- an integrated overall concept should be formulated for the RTI funding portfolio, whereby the existing range of programmes should be simplified. All programmes should therefore be reviewed with regard to their lever effect and either adapted or discontinued as necessary.
- funding instruments should be used in a targeted and co-ordinated manner. In particular, special attention should be given to the optimum interaction between the instruments to be used (grants, loans, assumption of liability etc.), the respective programme objectives and project types, as well as to appropriate funding cash values.

Monitoring und Evaluation:

- all programmes with a life of more than five years (or a volume of at least EUR one million per annum) must be evaluated by experts. The evaluation standards recommended by the Austrian Council must be applied.
- an integrated RTI monitoring system that caters for the information needs of all stakeholders as comprehensively as possible must be developed.

Use of Funding

In recent years investments in research and development in Austria have seen very dynamic growth in an international comparison. The R&D quota forecast by Statistik Austria for 2005 of 2.35 percent (measured in terms of gross domestic product) clearly exceeds the EU average. In recent years, the ratio of funds from private and public sources (taking into account income from the EU programmes) has varied between 62:38 and 65:35.

Besides direct spending, reference should also be made to the system of indirect research funding by tax incentives, which has been substantially improved in recent years. In addition to the tax allowance for economically valuable inventions, a tax allowance has been introduced for research and development as defined by Frascati, as has a research bonus that has been successively increased. Since 1 January 2005 contract research has also received preferential treatment under tax law, so that Austria now has one of the most attractive fiscal R&D promotion systems in the OECD.

Even though the European Commission is demanding a significant increase in funding for the Seventh Framework Programme for Research and Technology Development (2007–2013), European research funding should be regarded as a supplement to national efforts, and not as a substitute under any circumstances.

Barcelona Goal is Realistic

From today's perspective, the goals of the Austrian government to increase the R&D quota to 2.5% by 2006 and – in accordance with the EU's Barcelona goal – to 3.0% by 2010, appear perfectly realistic. However, the prerequisite for this is additional public and private investment in the next few years. The Austrian Council believes that the recently agreed plan for a "Research Bond" and the additional EUR 125 million that have already been made available for 2005 and 2006 represent a major step toward achieving the three percent goal.

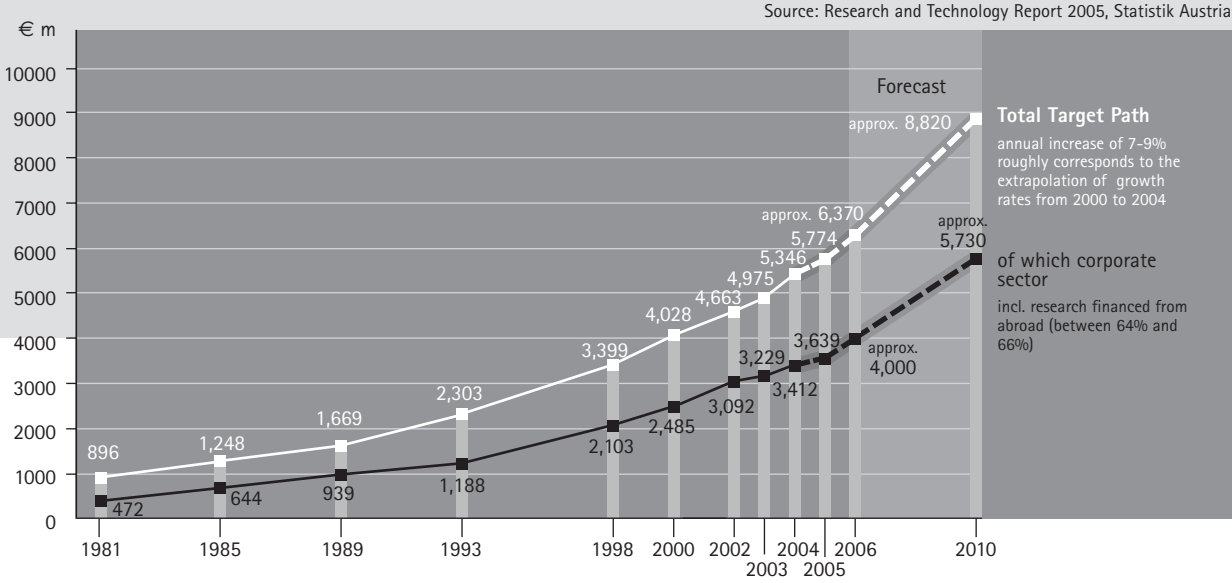
In order to achieve this target, R&D spending must be increased to approximately EUR 8.8 billion by 2010 – depending on the development of gross domestic product and inflation - the equivalent of an annual growth rate of some seven to nine percent.

This means that the federal government alone will have to spend almost one billion euros more in 2010 than in 2005 if the present financing structure is retained. If the financing structure were modified to comply with the ratio stipulated by the Barcelona goals, under which industry would provide two thirds of the financing and

The Path to the Three Percent Goal

Trend Scenario for R&D Expenditure in Austria up to 2010

Source: Research and Technology Report 2005, Statistik Austria



the public purse one third, the federal government would have to increase its spending by EUR 500 million. This in turn implies – provided there is steady growth in spending – a cumulative additional requirement on the part of the federal government of between EUR 1.5 and 2.7 billion from 2006 to 2010 compared with 2005 depending on the changes in the financing structure.

Growth in R&D expenditure is an important condition for achieving the goals of RTI policy, but on its own is inadequate for this purpose. It is equally important to strengthen human and physical capital. The macroeconomic conditions and above all the efficiency with which funding is used will likewise influence the development.

Continue the Successful Strategy

The dynamism of research investments confirms the strategic orientations defined by the Austrian Council in its strategy papers "Vision 2005 – Among the Best Through Innovation" and "Research Strategy Austria 2.5 % +plus – Prosperity through Research and Innovation." Taking into account specific characteristics of the Austrian innovation system, such as the predominance of SMEs in the economic structure and the high percentage of foreign R&D financing, the focus has fallen on expanding application-oriented research and development based on co-operation between science and industry in the non-university sector – while upholding the principle of free basic research.

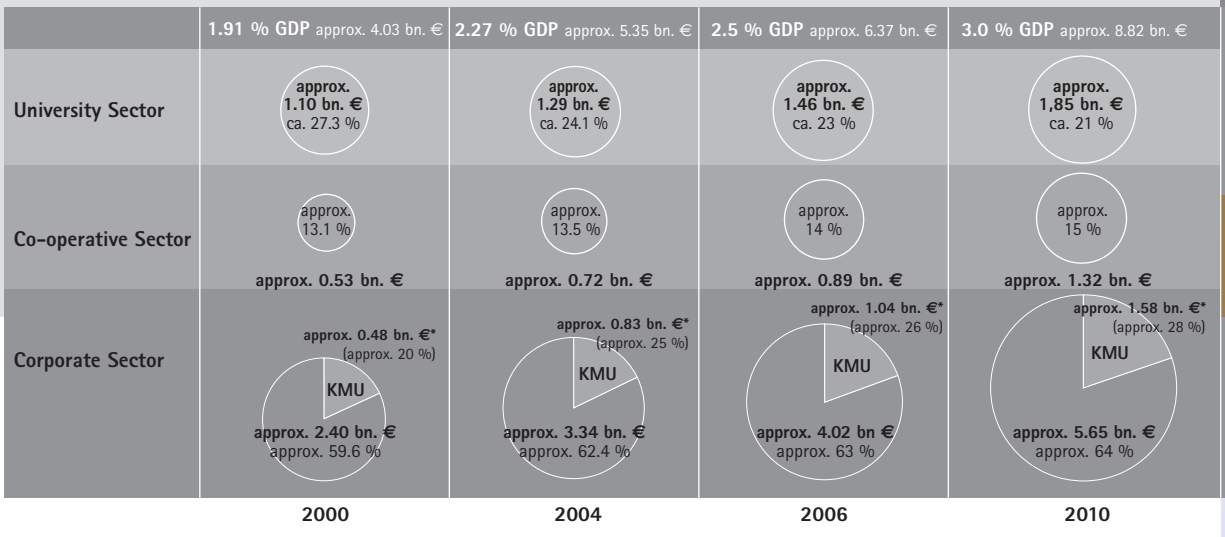
This successful strategy should be continued until 2010 and extended to include a quality campaign. Austrian research should also position itself at the top of the European league tables, both in terms of the quantitative criteria of the research quota and in terms of research achievements.
The share of research carried out by business enterprises should rise from 62 percent at present to some 64 percent in 2010.

This requires particularly strong growth in the co-operative sector (which represents the link between the universities and industry) accompanied by robust expansion in the corporate sector and a significant increase in the university sector.

A scenario calculated on the basis of this strategy for the period up to 2010 shows a good 80 percent increase in R&D investments in the co-operative sector from

Research Strategy 2010: Spending Scenario According to Performance Sectors

Source: Statistik Austria: AMC



* BIP 2006 ca. 255 Mrd., 2010 ca. 294 Mrd. (lt. WIFO 7/2005

2004 to 2010, an increase of some 70 percent in the corporate sector and an increase in the university sector of more than 40 percent (see fig.). The distribution of the funds raised from the bond-financed technology billion – as approved by the Nationalrat in 2005 – must follow the principles contained in this Strategy 2010, i.e. the focus must be upon a campaign to improve quality and a strategy of excellence, co-operation between science and industry and the setting of priorities along research themes that represent Austrian strength areas.

THE AUSTRIAN COUNCIL RECOMMENDS

Barcelona Goal:

- the increase in the public budget must be consistently advanced in line with the Barcelona goal. The estimated level of government spending on R&D in 2005 will have to rise by between seven and nine percent by 2010.

Strategic Orientation:

- impetus should be given to pushing forward the adopted research strategy that aims to strengthen co-operation between industry and science. The co-operative sector will continue to play an extremely important role here in coming years.
- in line with this strategic orientation, there should be a substantial increase in R&D expenditure in all sectors of performance – universities, business enterprises, co-operative sector . However, the co-operative sector should experience higher than average increases.

Financing Structure:

- the utilisation of the individual sources of financing (ordinary budget, Action Programme, National Foundation for RTD) to finance programmes and initiatives must follow a structural logic.
- financing of basic programmes and open-ended expenditure must be provided from ordinary budgets in future.
- funds from the National Foundation for RTD must be used for new programmes and initiatives with a long-term focus. In particular, they should be used to support the development of centres of excellence with a long-term focus.
- funds from the Action Programme should be focused upon impulse programmes of a temporary nature and for priority activities that go beyond the basic programmes.

Glossary

ACR	Austrian Cooperative Research
AIST	Austrian Institute of Advanced Science and Technology
ARC	Austrian Research Centers
ASA	Austrian Space Agency (since 2004: FFG, Aeronautics and Space Agency)
Austrian Council	Austrian Council for Research and Technology Development
AWS	Austria Wirtschaftsservice Gesellschaft mbH
Barcelona Goals	To achieve a research quota of 3% of GDP throughout the EU by 2010, whe reby two thirds should be financed by business enterprises and one third by the public purse
BIT	Bureau for International Research and Technology Co-operation (since 2004: FFG, European and International Programmes)
BMAA	Ministry of Foreign Affairs
BMBWK	Ministry for Education, Science and Culture
BMF	Ministry of Finance
BMGF	Ministry for Health and Women's Affairs
BMLFUW	Ministry for Agriculture and Forestry, Environment and Water Management
BMLV	Ministry of Defence
BMSG	Ministry for Social Security, Generations and Youth
BMVIT	Ministry for Transport, Innovation and Technology
BMWA	Ministry for Economic Affairs and Labour
Bologna Process	Strategy for the Europeanisation of the tertiary education sector
BRIDGE	Joint title for the bridging programme of the FFG and the FWF programme Translational Research
CDG	Christian Doppler Research Association
CeMM	Center of Molecular Medicine
CIP	Competitiveness and Innovation Framework Programme, 2007-2013
CIS	Community Innovation Survey
Competence Centres	Research centres of the competence centres programme
COST	Co-opération européenne dans le domaine de la recherche scientifique et technique (European Co-operation in the field of Scientific and Technical Research)
ERA	European Research Area
ERA-NET, ERA-NET plus	Programme lines in the Research Framework Programmes to network national funding programmes
ESFRI	European Strategy Forum on Research Infrastructures
ESO	European Southern Observatory
EU-Structural Fonds	Funds to eliminate structural economic and social problems in the EU
EU	European Union
EUREKA	European Network for Market-Oriented R&D
European Qualification Framework	Qualification Framework for the European Higher Education Area
Fachhochschulen (FH)	Fachhochschulen can be translated as polytechnics. Here the term is used to refer to all entities offering FH courses.
FFF	Austrian Industrial Research Promotion Fund (since 2004: FFG, General Programmes)
FFG	Austrian Research Promotion Agency

fForte	Initiative "Women in Research and Technology"
FORNE	Initiative "Research for Sustainable Development"
FP	EU Research Framework Programme
FTI	Research, Technology and Innovation
FWF	Austrian Science Fund
GDP	Gross domestic product
GM	Gender Mainstreaming
GSK	Geistes-, Sozial- und Kulturwissenschaften
ICT	Information and Communications Technologies
IMBA	Institut für Molekulare Biotechnologie
IMGuS	Institute for Medical Genome Research and System Biology
IMP	Institute of Molecular Pathology
K-ind, K-net	BMWA competence centres programme
Kplus	BMVIT competence centres programme
Lisbon Goal	Group of goals to increase the efficiency of the European economy with the key areas of innovation, know ledge and social cohesion
NAFIP	National Research and Innovation Plan
National-Foundation for RTD	National Foundation for Research and Technology Development
NIS	National Innovation System
ÖAW	Austrian Academy of Sciences
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
SME	Small and medium-sized enterprises
TIG	Technologie Impulse Gesellschaft (since 2004: FFG, Structural Programmes)
UG 2002	Universities Act 2002

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